PREFACE

This paper was prepared by the Institute for Defense Analyses (IDA) under the task order Defense Modeling and Simulation, in response to a task objective to provide technical support to operational activities of the Defense Modeling and Simulation Office (DMSO).

Over one hundred members of the unified commands generously gave their time for our interviews. Unfortunately, all their names were not recorded and cannot be listed here, although whatever benefit comes of the study is attributable directly to them. The following principals from the unified commands contributed their time to be interviewed or to comment on the report's draft: General Wesley K. Clark, USA, and Mr. Larry M. Blotzer, of the US Southern Command; Major General Joseph E. Hurd, USAF, Colonel Gabriel Rouquie Jr., USA, and Lieutenant Colonel Jerry G. Gelling, USMC, of the US Central Command; Major General M. P. DeLong, USMC, Colonel Robert J. Graebener, USA, and Commander John Ash, USN, of the US Atlantic Command; Colonel Jack Holly, USMC, Captain Alan Mark Gemmill, USN, Mr. Mel Chaloupka, and Dr. Frank Schwamb of the US Pacific Command; Lieutenant Colonel Steven D. Knott, USAF, Mr. Nelson Jennings, and Lieutenant Colonel Steve Alvarado, USA, of the US European Command; Colonel Chip Cobb, USA, Colonel Willy Bain, USMC, and Major Joel Parker, USA, of the US Special Operations Command; Dr. David Finkleman, Colonel Chip Reny, USAF, Lieutenant Colonel Monty Anderson, USA, of the US Space Command; Commander Phil Bloyer, USN, Lieutenant Colonel Paulette Buckingham, USA, Lieutenant Colonel Dave Gillette, USAF, and Mr. Keith E. Seaman of the US Transportation Command; and Commander Matt Dillon, USN, Commander Greg Hillis, USN, Major Robert F. McEniry, USAF, Major Charles Woodrow, USAF, of the US Strategic Command.

The following individuals outside the unified commands also contributed to the study through comment or discussion: Lieutenant General C. E. Wilhelm, USMC, and Lieutenant Colonel Terry H. Moore, USMC, Marine Corps Forces Atlantic; Colonel Dennis Phelan, USAF, Lieutenant Colonel Mark Cain, USA, Mr. Jude E. Shea, and Mr. Joe Spencer, of US Forces Korea; Colonel Tom Verbeck, USAF, Captain Earnie Rogers, USN, Lieutenant Colonel Doug Martin, USAF, and Lieutenant Colonel Joseph C. Barto III, USA, of the Joint Warfighting Center; Colonel Gary Tobin, USA, of the Warrior Preparation Center; Colonel Jack Walls, USAF, of the Armed Forces Staff College;

Colonel Ray Lynch, Dr. John L. Clarke, Lieutenant Colonel, USA, and Mr. Ronald Bechtold of the George C. Marshall European Center for Security Studies; Mr. Walter Schmidt, Dr. Dirk Coppierters, and Dr. Ian White, of the SHAPE Technical Center; and Dr. Reinhard W. Hutter and Dr. Uwe Dompke of IABG, Germany.

Mr. Louis C. Finch, Deputy Under Secretary of Defense for Readiness, Mr. Donald B. Johnson of the Office of the Deputy Under Secretary of Defense for Readiness, and Lieutenant Colonel Henry J. Coble, USMC, of the Joint Staff J-7 provided enthusiastic discussions and encouragement throughout the process of producing the report.

Within IDA, the document was reviewed by Dr. William B. Buchanan, Dr. John D. Fletcher, Dr. Brian A. Haugh, Rear Admiral Robert P. Hilton Sr., USN (Ret.), and Dr. Jesse Orlansky. Their contributions are hereby acknowledged. Dr. Richard J. Ivanetich served as task leader and reviewer. Katydean Price, technical editor, greatly contributed to the structure and clarity of the manuscript.

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EXECUTIVE SUMMARY

PURPOSE

This study is intended as a step toward ascertaining the modeling and simulation (M&S) needs of the unified commands and how well these needs are being met. Models and simulations are but tools applied to a specific function, i.e., training, planning, operations, or analysis. To understand the technical requirements of a modeling and simulation tool, its application must be understood first. The purpose of this paper is, therefore, to provide for the M&S community a focus on the unified commands' application of M&S with specific emphasis on joint training and operations.

BACKGROUND

The effects of the last decade's dramatic changes in threat and budget have yet to reach a steady state. The Chairman, Joint Chiefs of Staff, has established a new training paradigm in the Joint Training System that is in place and maturing. Anticipated changes in the 1997 Unified Command Plan may broaden the Atlantic Command's role in joint training. Furthermore, there has been a persistent increase in emphasis on joint operations since passage of the Goldwater-Nichols Defense Reorganization Act of 1986.

APPROACH

A team sponsored by the Defense Modeling and Simulation Office (DMSO) conducted a liaison visit to each of the unified commands during the first half of 1996. The purpose of the visits was to inform the commands of DMSO's activities and the activities of the wider M&S community. The team inquired into the commands' uses of M&S tools, how effective these tools were, and how DMSO and the M&S community might respond to improve the capability of their tools. Recurring themes emerged during these interviews regarding training and analysis at the unified commands. We noted a strengthened but still evolving joint orientation of the unified commands in their joint training functions. Highlighted is the emerging role of the joint task force (JTF) as the major operational warfighting subordinate of the unified command, supplanting the Service component in that role.

The individuals interviewed were typically at division chief level. They possess considerable experience at higher command echelons and with training and analysis. We

interviewed those responsible for training and for planning and analysis, typically in the J-3 and J-5 offices, respectively. Each of the nine unified commands, and a single subordinate unified command, United States Forces Korea, was visited.

The study began with a review of the *Unified Command Plan,* the *Joint Strategic Capabilities Plan,* and joint doctrine. These documents have undergone dramatic change over the last decade, affecting training and operations in the unified commands. Based on this preparatory research, a questionnaire was constructed from which interviews were conducted with over one hundred respondents from the unified commands.

From the information provided by these interviews, several types of training event structures currently in use were isolated and their characteristics identified. Candidate cost and effectiveness criteria were developed that allowed comparison of the different event types, i.e., under what conditions and for what purposes would one training event type be favored over another. The implications of each training event type on the supporting M&S tools were derived.

FINDINGS

Trends and Constants in the Unified Commands

Some highly successful training events and programs were established and flourished during the last years of the Cold War. Because there is inertia in the system—that is, "we train this way *this* year because we trained this way *last* year"—it is important to examine those things relevant to operations and training that have changed (the *trends),* and those things that remain invariant (the *constants).*

Several major shifts in unified command operations are readily apparent. In short, we have gone from a situation of permanent warfighting organizations with standing detailed plans for execution to a situation where temporary joint warfighting organizations must rapidly be formed while producing a plan in response to a crisis. Forces, once forward deployed, now reside in the continental United States assigned to a single unified command. Simultaneously, the focus on high intensity combat against a powerful and known foe has shifted toward military operations other than war.

These trends may appear to be most relevant to the European Command. However, it is in the European theater that the use of M&S for training was advanced to today's levels. Today's M&S is a legacy of that era. The new national security environment has changed the mix of military operations conducted, and evolving joint

doctrine has changed how those operations are conducted. Figure ES-1 shows these cause and effect relationships. Should tomorrow's M&S be merely better than that developed for the Cold War, pre-Goldwater-Nichols era, or should it be substantially different as well?

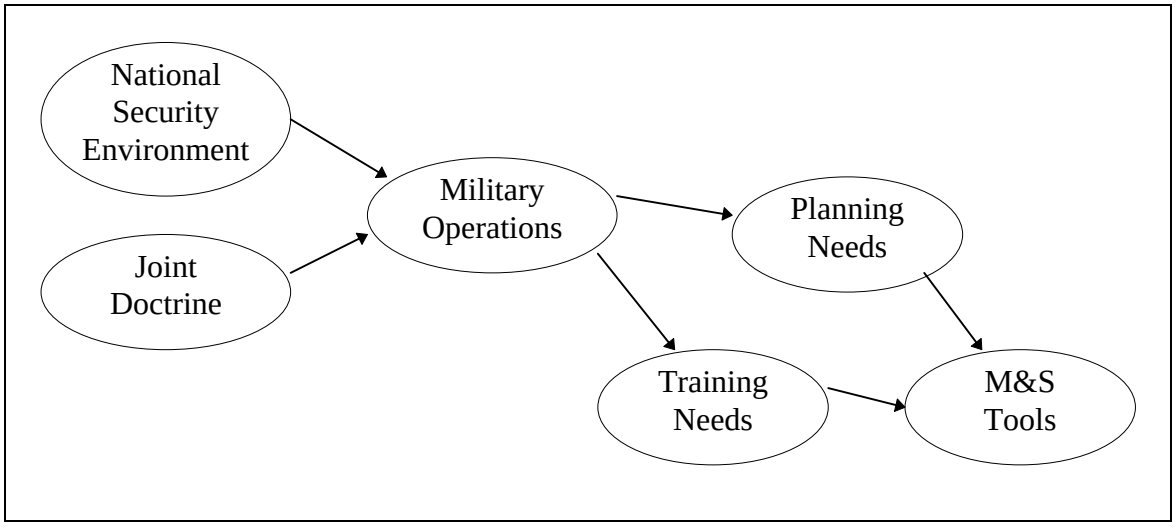

Figure ES-1. Requirements Drivers for M&S Tools

Other unified command characteristics have remained constant, irrespective of the dramatic changes in the strategic environment of the last decade. Unified command staffs remain small. They continue to be responsible for planning, analysis, and decision making at the strategic and operational levels of war.

Assumptions Challenged by the Unified Commands

During our interviews the respondents postulated that many in the field operated under a variety of assumptions or misconceptions that need to be examined. Certainly they should be challenged after the dramatic change in the operational environment following the end of the Cold War. One assumption deserving of examination is that strategic, operational, and tactical training audiences can be trained simultaneously. Another is that the needs of the joint commands are met when the needs of the Service commands are met. The Joint Training System makes a significant distinction between joint training and component interoperability training, yet many view the two as synonymous. In the former, the *joint commands* constitute the training audience; in the latter, the *interoperating Service commands* are the primary beneficiaries of training.

Computer-assisted exercises are conducted in real time, favoring tactical Service audiences over the strategic and operational joint audiences. Computer simulations reflect the heavy reliance on the tactical time frame exercise, resulting in a stronger modeling emphasis on shooters than on movers, on weapons-level detail than on broad, functional detail, and on conventional forces than on special operations forces.

Exercise Types Identified

Five significantly different categories of training event were identified and assessed.

- The *plan execution exercise* conducted in the tactical time frame with several command echelons but without troops
- The *plan execution exercise* conducted in discrete time steps spanning weeks or months with only a single command echelon and without troops
- The *plan execution exercise* conducted in the field or at sea with troops
- The *plan development exercise* conducted in the strategic time frame with a single or partial command echelon
- The *plan development exercise* emphasizing JTF formation and time-sensitive planning

The first of these types was found to be the dominant exercise form.

Unified Command Responsibilities

The unified commands integrate and synchronize forces to execute assigned missions. That role is implemented largely through the planning process. In addition to developing plans for deployment, employment, sustainment, and redeployment, the unified commands monitor the execution of plans to adjust, for example, personnel and logistics flows. They also retain a real-time interest in strategic intelligence assets and strategic weapon systems, as well as in crisis termination.

Figure ES-2 compares the unified commands' strategic functions and the training opportunity provided by the dominant training event type—the *real-time*, *week-long*, *single-thread of decision*, *plan execution* exercise conducted with *multiple command echelons* in realistic conditions but *without troops* in the field. While it is conducted in the tactical time frame and excludes many of the unified command's responsibilities, the exercise excels at large-scale integration of command and staff echelons.

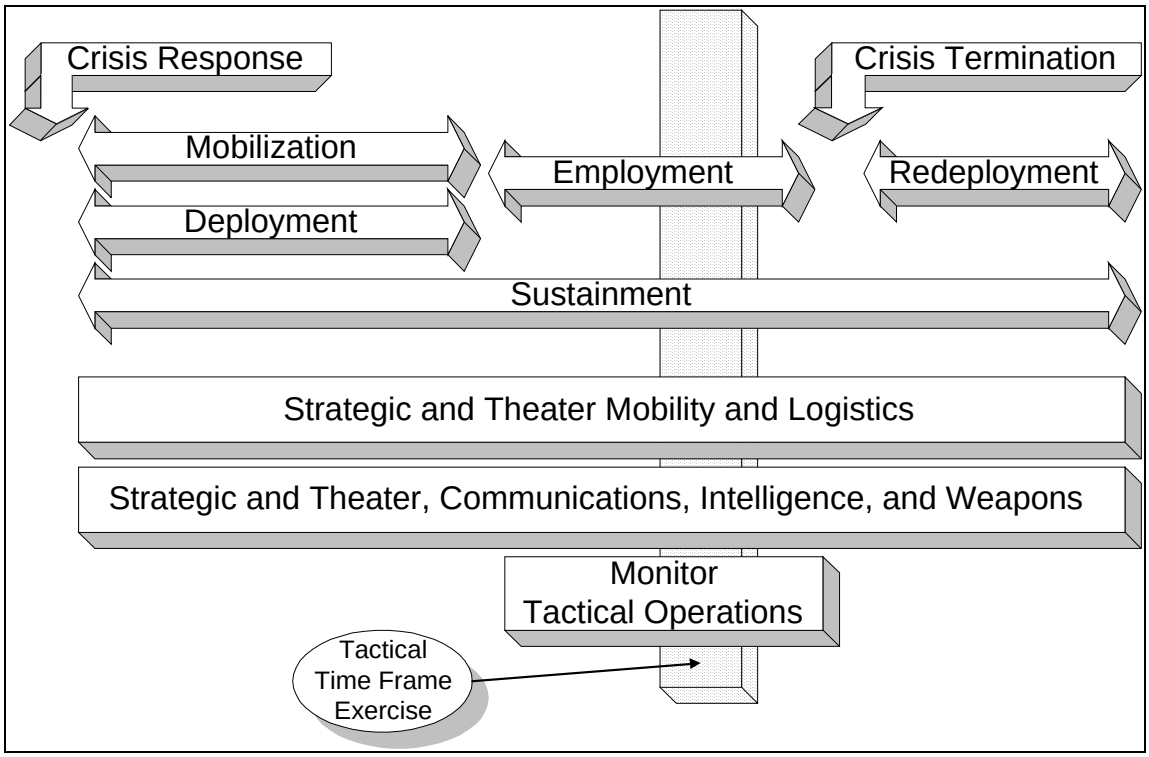

Figure ES-2. Strategic Functions and the Tactical Time Frame Exercise

CONCLUSIONS AND RECOMMENDATIONS

Strategic Outcomes Are Excluded in Plan Execution Exercises

The joint commands—the unified commands, subordinate unified commands, and joint task forces—are higher echelon commands responsible for decision making in the strategic and operational time frames. Yet the most prominent training event is conducted in the tactical time frame. This type of exercise does not span a sufficient time frame to demonstrate the value of those decisions and actions designed to produce operational or strategic effects. Therefore, only the tactical effects become known, excluding the preponderance of unified command actions. *An over-reliance on training in the tactical time frame has as its consequence a training shortfall at the strategic and operational levels of war—the domain of the joint commands.*

Exercise in the strategic time frame. The first problem to solve is provision of a training event that spans a time frame sufficient to stress the joint audience's strategic and operational responsibilities. Special operations, information operations, seaport and airport seizure, air interdiction and strategic bombardment, and exercises underway to

show US presence and resolve are examples of actions whose outcomes span the tactical and strategic time frame.

Exercise to develop the commander and staff team and to develop strategic theater vision. Conduct an exercise early in a commander in chief's (CINC's) tenure to help him understand the current theater vision and to develop his own. Such an exercise would expose the staff to the full range of the commander's decision-making style, expose the commander to his staff resources, and build the commander and staff team. In other words, it would enable staff members to understand their new commander and to be able to carry out their specialized daily tasks acting in the CINC's stead. To meet training objectives, the commander and staff should run through the variety of contingencies that might occur in the CINC's theater. Breadth of exposure is the objective. Depth can be pursued as significant issues are uncovered. Pre-execution, execution, and post-execution phases should all be given equal emphasis.

Exercise to build geographic and functional command teams. A training event that brings together the theater and functional CINCs and their principal staffs apparently does not exist. The functional commands lack the opportunity to provide theater commands with an understanding of their full range of capabilities. Further, the functional commands lack an opportunity to fully learn the theater commands' warfighting needs. In general, the dominant real-time exercise highlights the capabilities of the Service components and allows the functional commands to participate in tactical operations only. A tactical time frame exercise provides an inadequate training environment for exploring the full capabilities of the Special Operations Command, Space Command, Strategic Command, and Transportation Command.

Build tools for small staffs and quick response. The unified commands have very few people to support a training event. Therefore, only a very few operators should be required to prepare a data base for a training event, and very few operators to support the actual event. Exercise support, probably including a simulation model, should satisfy those requirements to be judged cost effective. Tools must run much faster than real time. The ability to produce a distribution of outcomes at an abstract level of detail is more important than producing a single plausible outcome in great detail.

If a model is built to meet the training needs of the unified commands, it is equally applicable to their analytic needs. Or, more correctly, a model suitable for strategic and operational planning and analysis can be used to meet the training needs of the unified commands. Those requirements include the ability to quickly generate and

evaluate alternative courses of action, to wargame several scenarios, and to do capability trade-off studies. Again, great detail is not a requirement. Quick preparation, low operator costs, and turnaround measured in hours are requirements.

Pre- and Post-Execution Activities Are Excluded in Plan Execution Exercises

Many of the higher echelon commands' responsibilities are embedded in the pre- and post-execution phases rather than in the plan execution phase, as indicated previously in Figure ES-2. Crisis response, mobilization, deployment, and strategic and operational employment occur before the execution phase. Tactical employment occurs during the execution phase. Crisis termination and redeployment occur after the execution phase. Sustainment occurs throughout. Yet the execution phase is the focus of the dominant exercise type and the supporting M&S tools.

Exercise deployment and strategic and operational employment. Joint Operations Areas (JOAs) are typically not well-developed theaters of operation. Infrastructure is not in place when the JTF arrives. On the contrary, the JTF must plan and deploy communications, intelligence, and logistics infrastructure. This is particularly true of those JOAs established in developing countries for humanitarian assistance, disaster relief, and peace operations. Yet the typical exercise begins when the first shot is fired and spans perhaps the first major engagement. Beginning an exercise assuming the necessary infrastructure and forces are in place begs the issue. Infrastructure deployment and strategic and operational force employment have been shown to be problematic and warrant training. Some very useful joint exercises might well *end* rather than *begin* when the first shot is fired.

Many of the joint commands' functions must be accomplished before tactical employment begins. Simulations focused on tactical combat adjudication will not support this critical type of training. Joint M&S tools should support exercises for strategic deployment of forces, logistics, and infrastructure.

Exercise the planning process—train the planner. Higher echelon decision making is manifest in a plan—the product of the *planning process*. Yet the dominant training event stresses staff procedures and staff interactions during plan execution at and below the Service component level. The residual effect of the focus on high-intensity conflict that benefited from years of deliberate planning is an emphasis on that which could not be planned, i.e., on plan execution and current operations. However, today's joint commands increasing develop plans in response to rapidly emerging contingencies.

Exercise decision support. With little or no notice, the planning staff will be tasked to provide alternative actions or options, with pros and cons, for the CINC. As a crisis develops, the CINC may make many requests for analytic support, all part of his continual construction of a vision for crisis response. A wargame could provide an appropriate training environment for that process. An exercise to train plan development may equally train decision support. Both follow the same process and use the same tools.

Training in the unified commands should emphasize the planning process under time-sensitive conditions over real-time execution of combat operations. Constructing a Time Phased Force and Deployment List in six to eight hours, after considering alternative force mixes, is a meaningful objective. Ultimately, the objective of the exercise is to train the process of producing a robust, flexible plan.

JTF Creation Is Inadequately Addressed in the Plan Execution Exercise

The unified commands are increasingly occupied in standing up JTFs in response to a developing contingency as opposed to training for an anticipated action that has benefited from extensive deliberate planning. The JTF's temporary nature and crisis response posture impose a very different training challenge than training a standing organization with a standing plan. A forming JTF is focused on the crisis action process, which is oriented on time-sensitive plan development. M&S tools to support JTFs were consistently discussed as pieces tightly integrated into their operational environment rather than as stand-alone products for training.

Interagency Representation Is Limited

Exercise crisis termination with joint and interagency audiences. The JTF is responsible for conducting the operational level of war—planning and conducting tactical operations to meet strategic objectives—but the unified command remains responsible for accomplishment of strategic objectives. The JTF's operational objectives may be concerned with the defeat or containment of a military opponent, while the strategic objectives could be about balance of power and stability in the region after crisis termination. Crisis termination is the responsibility of the CINC, the Chairman of the Joint Chiefs of Staff, the State Department, the National Security Council, and the National Command Authorities. It is best explored as an interagency wargame. The M&S support for such an exercise is not about tactical engagements but about an aggregate balance of military power, political forces, and macroeconomics.

Ensure adequate emphasis on information operations. There are different audiences that practice information operations. At the tactical level, simulations to support information operations may require detailed representation of command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) assets. A robust representation of information flows down to the message level and a thorough representation of enemy command and control processes may be required. At a strategic level, a nation's public and political will or its economy might be the target of attack. Simulations to support higher-order information operations should represent social, political, and economic variables and interactions, not merely C4ISR assets.

Ensure adequate emphasis on military operations other than war (MOOTW). Retrofitting non-combat operations into combat models has been problematic in the past; developers of future models should not assume it would be any easier now. M&S tools for MOOTW must orient on contagion and natural disasters, macroeconomic and soft sociological variables; include local and regional infrastructure (e.g., water treatment, hospitals), political and military factions, and non-governmental organizations (NGOs); and run much faster than real time.

Too Many Echelons in the Training Audience Diffuse Training Focus

Simply designating the highest echelon as the primary training audience does not by itself make that echelon the primary beneficiary of training. The exercise must be designed to focus training benefit on the desired primary training audience. *Identifying the right training audience for an exercise must balance contradictory cost and effectiveness objectives—command and staff integration versus focus on a specific training audience.* A multi-echelon training audience—with some echelons operating in the strategic and operational time frame while others operate in the tactical time frame—invariably leads to some echelons being shifted out of the primary training audience and into the secondary training audience or, in the worst case, into a training support role.

Training Joint Commands Using Many Echelons in the Training Audience Requires a Lower Echelon Model and Vice Versa

The lowest echelon in the training audience in a computer-assisted exercise communicates with a response cell, which in turn communicates with the supporting M&S tool. Hence, the M&S tool must simulate the actions of forces below the lowest echelon in the training audience. In a single-echelon exercise, the lowest echelon in the

training audience and the primary audience are one and the same, and the *semantic gap* between the actions carried out in the M&S tool and the primary training audience is small. If the number of echelons in the training audience is large, then the semantic gap between the actions carried out in the simulation and those of concern to the highest echelon in the training audience is large. The gap is especially large if the lowest echelon is tactical and the highest echelon is operational or strategic.

M&S tools that *support* a tactical training audience *require* a tactical training audience to aggregate the information for successively higher echelons until it is at the appropriate level of detail for the unified command. Such M&S tools require a large training audience to bridge the gap between it and the unified command. Still, training in the tactical time frame stresses only a fraction of the higher echelon joint training audience's responsibilities.

The Plan Execution Exercise Integrates Command and Staff Echelons

Individuals are trained and assembled into small units. Small units are trained in a variety of ways culminating in a field training exercise. Larger unit headquarters are well trained in a computer-assisted commander and staff exercise using real-world command and control systems. Commands at the strategic and operational level are most appropriately trained in a wargame. In each type of training event, a tight focus is maintained on the training audience.

Integrating the force is the most complex and expensive type of training event. The focus is not on any particular audience: it is on command and staff *integration*. At higher echelons, those concerned with current operations may be *over exercised*, those working within the 24-hour staff procedure cycle *well exercised*, and those responsible for planning to a distant decision horizon nearly *excluded from the exercise*. Yet the joint integration exercise has become the event that is expected to produce trained and ready forces. *This study recommends abandoning the expectation that the large-scale, integrating exercise—whether conducted in the field with troops or computer assisted—can train all audiences.*

1. INTRODUCTION

1.1 PURPOSE

This report describes work conducted by the Institute for Defense Analyses (IDA) for the Defense Modeling and Simulation Office (DMSO) on the use of modeling and simulation (M&S) in the unified commands. This report focuses on the unified commands' operational needs and how they might affect ongoing M&S developments. The current objectives of this report are to capture specific concerns of the unified commands and present them to the M&S community for consideration and action. As such, the report is intended for M&S developers to make them more aware of the new reality faced by their unified command customers.

1.2 BACKGROUND

All military operations are conducted under the legal authority of a commander in chief (CINC) of one of the unified commands. They are the first to be faced with changing requirements. Because of major changes in the national security environment, the unified commands are planning and conducting a different mix of military operations (*what* they do) than 10 years ago. New joint warfighting doctrine (*how* they *do* it) is being produced at a dramatic rate. And new joint training doctrine (how they *train* to do it) has recently been distributed by the Chairman, Joint Chiefs of Staff. M&S tools contribute to training, planning, and operations in this complex and dynamic environment. Ongoing M&S programs should be in alignment with this changing environment as depicted in Figure 1.

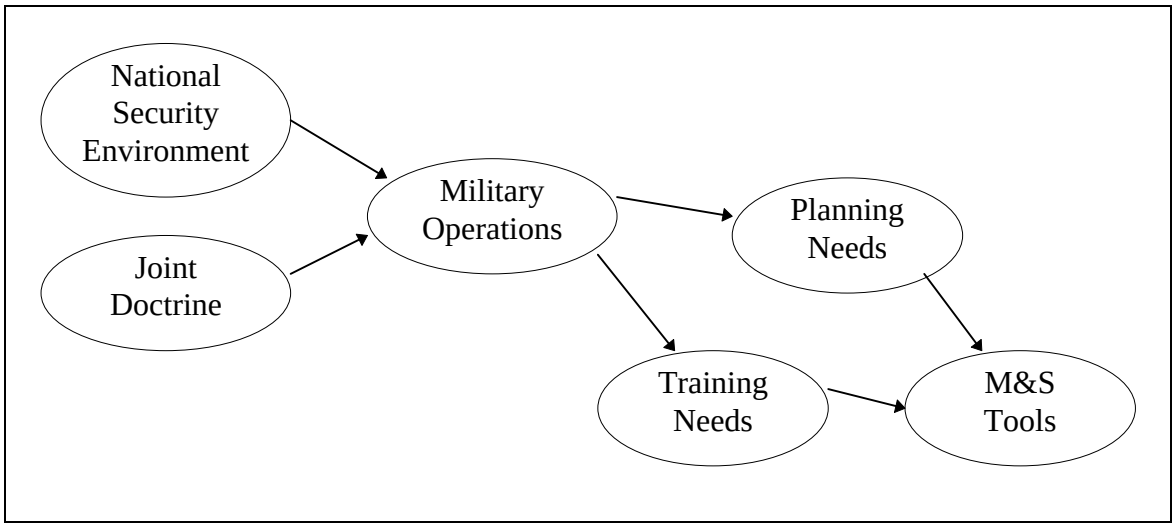

Figure 1. Requirements Drivers for M&S Tools

1.3 APPROACH

Our effort began with a review of official joint doctrine, the *Unified Command Plan* and the *Joint Strategic Capabilities Plan*. The dramatic changes in these documents over the last decade that might affect training and operations in the unified commands were captured in a set of trends and constants, i.e., those things that have changed in the last decade and those that have remained the same.

Based on this preparatory research, we constructed a questionnaire from which structured interviews were conducted with over one hundred respondents from the unified commands. Questions included where the unified commands turned for M&S support (within and outside of their commands) and how ongoing M&S initiatives would affect their training, analysis, and operations.

A DMSO-sponsored team conducted a liaison visit to each of the unified commands during the first half of 1996, the purpose of which was to inform the commands of DMSO's activities and the activities of the wider M&S community. Concurrently, the team inquired into the commands' uses of M&S tools, how effective those tools were, and how DMSO and the M&S community might respond to improve the utility of their tools.

The individuals interviewed were typically at division chief level. They possessed considerable experience at higher echelon commands and with training and analysis. We interviewed those responsible for training and for planning and analysis,

typically in the J-3 and J-5 offices, respectively. Each of the nine unified commands, and a single subordinate unified command, was visited. The subordinate unified command in Korea is often excluded from consideration, which we consider a serious shortcoming given that that command is responsible for one of the two major regional contingencies. The findings, conclusions, and recommendations in this report do not necessarily reflect the position of the unified commands.

Recurring themes emerged during these interviews regarding training and analysis at the unified commands. We noted a strengthened but still evolving joint orientation of the unified commands in their joint training functions. The relatively new training paradigm established in the Joint Training System[1] is in place and maturing. Therein exists a documented framework for joint doctrine, training, and requirements.

One prominent concern expressed was that some highly successful training events and programs were established and flourished during the last years of the Cold War. Because there is inertia in the system—i.e., "we train this way *this* year because we trained this way *last* year"—it is important to examine those things relevant to training that have changed (trends), and those things that remain invariant (constants). These trends and constants have not yet fully affected training operations and M&S development even though the unified commands are confronted with them daily. The unified commands are users of forces and resources. With respect to this study, they are users—the customers—of M&S.

From the information provided by these interviews, we isolated several types of training event structures currently in use and identified their characteristics. We also derived the implications of each training event type on the supporting M&S tools. As part of our analysis, we developed candidate cost and effectiveness criteria that allow comparison of the different event types, i.e., under what conditions and for what purposes would one training event type be favored over another.

A second category of concern is what the unified commands identify as assumptions or even misconceptions about training commonly held in the field. These assumptions appear to be the remnants of the Cold War. Valid in the mid-1980s, these assumptions and misconceptions are made explicit and challenged in this report.

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[1] *Joint Training Policy for the Armed Forces of the United States*, CJCSI 3500.01, November 21, 1994.

1.4 ORGANIZATION

Joint terminology is well defined in official publications but used inconsistently by many in the field. Therefore, Chapter 2, The Unified Commands, lays the foundation by describing what the unified commands are and what they do with particular attention paid to formal definitions. Chapter 3, Higher Echelon Joint Training, describes several typical training event structures conducted for higher echelon audiences, what and who are being trained, how training occurs, and a comparison of the different training events against the cost and effectiveness criteria developed. Chapter 4, Findings, Conclusions, and Recommendations, summarizes the implications of the previous chapters and makes recommendations for the joint training and M&S communities.

Two appendices are provided. Appendix A gives an overview of the joint planning process. Appendix B provides an overview of the United States Atlantic Command's tiered approach to joint training.

Also provided are lists of references and of acronyms used throughout the report.

2. THE UNIFIED COMMANDS

2.1 WHAT ARE THE UNIFIED COMMANDS?

The president of the United States, through the secretary of defense, and with the advice and assistance of the Chairman of the Joint Chiefs of Staff (CJCS) establish the unified commands.[2] All military actions are conducted under the authority of the commander in chief of a unified command. The number of unified commands is not fixed by legislation. Their number, areas of responsibility, and functions may change over time.

A CINC, when so authorized through the CJCS by the secretary of defense, may establish subordinate unified commands. The secretary of defense, a CINC, a commander of a subordinate unified command, or the commander of an established joint task force may establish a joint task force with either geographic or functional responsibilities.[3]

A unified command or subordinate unified command is assigned a geographic area or a function that is of a permanent or semi-permanent nature. The joint task force is assigned an area or function that is of a temporary or less enduring nature.

There are two chains of command relevant to these discussions—the *producer* and the *user* chains. Both chains originate in the National Command Authorities (NCA), i.e., the president and the secretary of defense. From the NCA, the producer chain of command goes to the military departments of the Army, Navy, and Air Force and to the Department of Defense agencies and field activities. The secretary of a military department is responsible for and is tasked to recruit, organize, train, and equip the forces assigned to the combatant commanders, i.e., to *produce* warfighting capability for the CINCs to use.[4] From the NCA, the user chain of command flows directly to the CINCs.

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[2] United States Code, Title 10, Section 161.

[3] *Unified Action Armed Forces (UNAAF)*, Joint Pub 0-2, February 24, 1995.

[4] United States Code, Title 10, Sections 3013 (b) and 8013 (b).

CINCs *use* forces and resources to accomplish tasks assigned by the NCA. The CJCS transmits orders from the NCA to the CINCs and is the principal military advisor to the NCA.

Each unified command has either geographic or functional warfighting responsibilities. It is common to have both Service and functional components (producers) as well as subordinate unified commands (users). United States Forces Korea, a subordinate unified command, is treated here as an equal to the unified commands.[5]

United States unified commands with geographic responsibilities are as follows.

- Atlantic Command (ACOM)
- Central Command (CENTCOM)
- European Command (EUCOM)
- Pacific Command (PACOM), and its subordinate unified command, United States Forces Korea (USFK)
- Southern Command (SOUTHCOM)

The geographic boundaries of these commands are specified in the *Unified Command Plan* (UCP) that is updated periodically. Although the UCP is classified, an excellent unclassified history of the UCP is available from the Joint Staff History Office.[6] The classified *Joint Strategic Capabilities Plan* (JSCP) tasks each unified command with warfighting responsibilities. Specifically, the commands are tasked to develop operations plans and are apportioned forces and resources for use in developing those plans.

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[5] The commander in chief of United States Forces Korea is also commander in chief of United Nations Command (UNC) and of Combined Forces Command (CFC). Through these positions he has direct access to the presidents of the United States and the Republic of Korea and to the Secretary General of the United Nations. In this role, CINCUNC enjoys the same status as two NATO commanders, Supreme Allied Commander Europe (SACEUR) and Supreme Allied Commander Atlantic (SACLANT) who are dual-hatted as US commander in chief European Command (USCINCEUR) and commander in chief US Atlantic Command (USCINCACOM), respectively.

[6] Joint History Office, *History of the Unified Command Plan: 1947 to 1993.*

Other United States unified commands have global warfighting responsibilities for a single function. They are as follows.

- Space Command (SPACECOM)
- Special Operations Command (SOCOM)
- Strategic Command (STRATCOM)
- Transportation Command (TRANSCOM)

Enduring *supported*/*supporting* relationships between two or more unified commands are defined in the UCP, or such relationships may be entered into temporarily. Most typically, a geographic (or theater) command is supported and one or more functional commands serve in a supporting role. There are, however, some noteworthy exceptions. For example, the Special Operations Command, a functional command, can be tasked directly by the National Command Authorities and be the *supported* command.

Specified commands are also legally authorized, although none exist today. They are typically composed of a single Service. The best known and most recent specified commands were the United States Forces Command (FORSCOM), now an Army major command; the Strategic Air Command (SAC), now absorbed into STRATCOM, a unified command; and the Air Combat Command (ACC), an Air Force major command.

Inconsistent use of terminology quickly leads to miscommunication. Therefore, for the duration of this report, the following definitions apply and will be used consistently.

The terms *unified command* and *combatant command* are reserved for those commands previously identified with geographic or functional warfighting responsibilities. *Theater command* is synonymous with unified commands having geographic responsibilities. A unified command includes the commander and the staff but not its subordinate organizations.

The acronym *CINC* will be used only to refer to the individual commander of a unified command. The term *combatant commander* refers to the CINC of any unified command. The term *Joint Force Commander* (*JFC*) is used generically to refer to the commander of a unified command, subordinate unified command, or joint task force.

The term *component* refers to the Service or functional components of a unified command.

Figure 2 shows five notional component headquarters. Each unified command has component headquarters for Army forces (ARFOR), Air Force forces (AFFOR), Navy forces (NAVFOR), Marine Corps forces (MARFOR), special operations forces (SOF), and other functional forces as appropriate. In EUCOM, for example, United States Army Europe (USAREUR) is the ARFOR, and Special Operations Command Europe (SOCEUR) is the theater's special operations component. A component includes both commander and staff but not the component's subordinate forces or units.

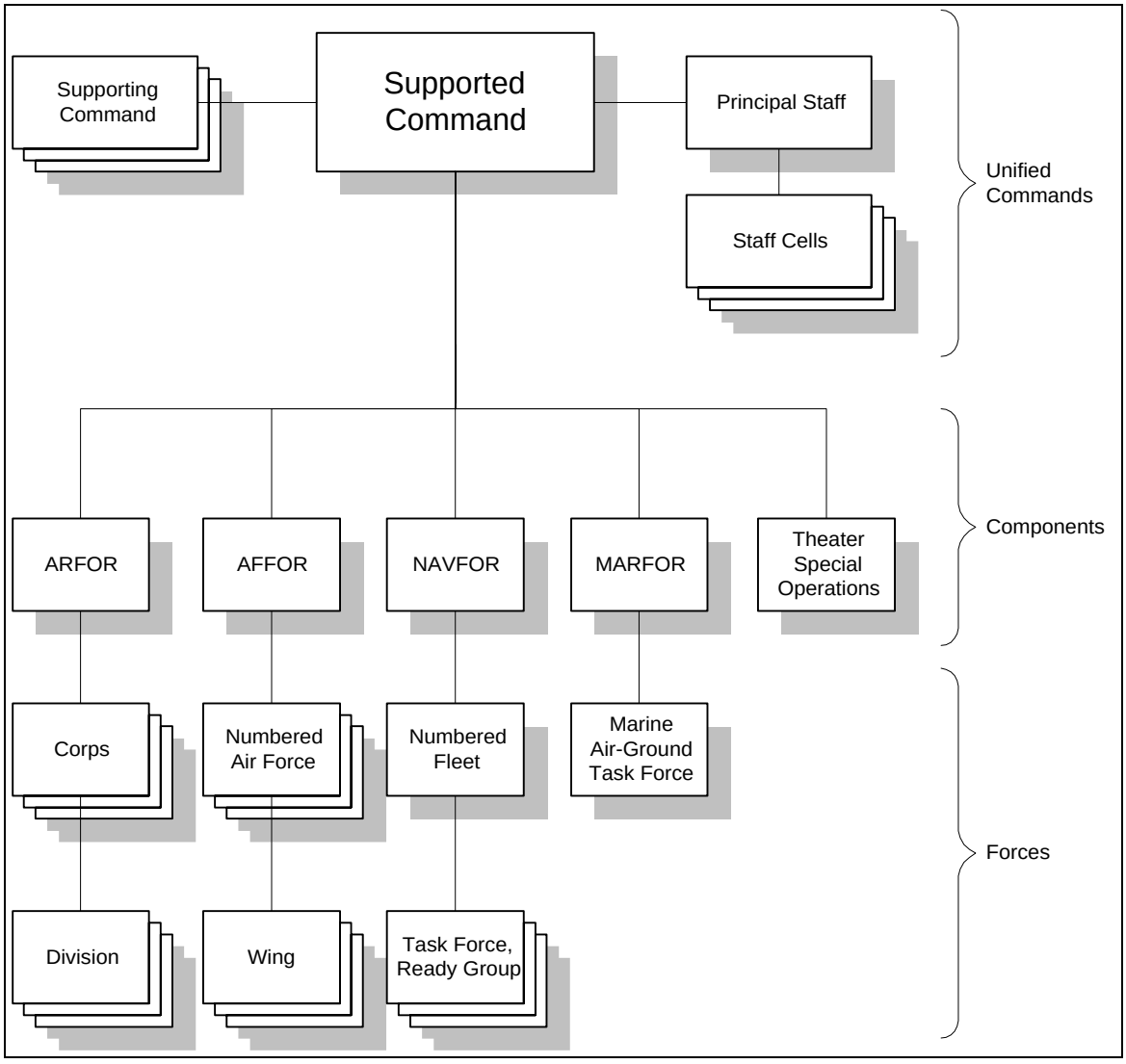

Figure 2. A Typical Unified Command

The terms *forces* and *units* are used interchangeably and refer to the military units that may be assigned, apportioned, or allocated to CINCs. Examples shown in Figure 2

include Army corps and divisions, Air Force numbered air forces and wings, Navy carrier battle groups and amphibious ready groups, and Marine air-ground task forces.

2.2 WHAT DO THE UNIFIED COMMANDS DO?

The unified commands integrate and synchronize forces to execute assigned missions. That role is implemented through plan development and subsequent plan execution monitoring. Formerly, Component commands integrated forces of a single Service, and the unified command integrated Service forces into joint forces under the unified command or a subordinate unified command. Today's unified commands are more likely to integrate Service forces under a temporary joint command, the Joint Task Force (JTF). The JTF assumes a similar role as the unified command but for a more localized and shorter duration contingency.

The unified commands develop plans. The primary responsibility of the unified command is *planning*. A training event, then, ought to train planners. As specified in the *Unified Action Armed Forces* (UNAAF), the primary responsibilities of the commander of a unified command are as follows.

> The combatant commanders are responsible for the development and production of joint operations plans. During peacetime, they act to deter war and prepare for war by planning for the transition to war and military operations other than war. During war, they plan and conduct campaigns and major operations to accomplish assigned missions.[7]

In a period of relative peace, what is being called the post-Cold War era or what some call an inter-war period, the unified commands act to assure stability in their region and plan for contingencies of all types. The unified commands are busy today conducting operations for peacekeeping and humanitarian assistance, and regional exercises to assure access to host nations and to build mutual trust between neighboring countries within their regions. Civil affairs and political-military exercises are increasingly important activities. Continuing from the UNAAF:

> The *Joint Strategic Capabilities Plan* tasks the combatant commanders to prepare Joint operation plans that may be operation plans (OPLANs),

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[7] UNAAF, p. IV-6.

> concept plans with or without Time-Phase Force and Deployment Data, or functional plans.[8]

OPLANs deal with specific threats and have a Time-Phased Force and Deployment List (TPFDL) identifying by name those forces that will deploy in response to the contingency. Concept Plans[9] (CONPLANs) are more general without specific threat and may or may not have Time-Phased Force and Deployment Data (TPFDD). The TPFDD does not list specific units but, rather, types of units. And finally from the UNAAF, the unified commands:

> Maintain the preparedness of the command to carry out missions assigned to the command. Carry out assigned missions, tasks, and responsibilities. Assign tasks to, and direct coordination among, the subordinate commands to ensure unity of effort in the accomplishment of the assigned missions.[10]

The CINC is responsible for the training of forces assigned to him, and he has the authority to assign tasks to subordinate headquarters. United States Code establishes that combatant commanders give authoritative direction to subordinate commanders and forces necessary to carry out the mission assigned, to include authoritative direction of all aspects of military operations, joint training, and logistics.[11] Frequently, the unified commanders appoint a subordinate Joint Force Commander and form and assign tasks to a JTF for a crisis or for a specified mission and specified time frame. At both levels of command the focus of planning is embedded in the Joint Operation Planning Execution System (JOPES) tools.

The unified commands monitor plan execution. Mission plans can become obsolete, requiring new plans or modifications to existing plans. The mission planning cycle may be initiated upon receipt of new orders or upon recognition that the current plan has been obviated by political or military conditions not apparent when the original plan was made. Plans and orders must be issued sufficiently in advance so that resources, units or supplies are in place when needed. At the strategic echelon, plans may require movement of forces from the continental United States (CONUS) to a crisis area or even

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[8] UNAAF, p. IV-6.

[9] Defined in *Doctrine for Planning Joint Operations*, Joint Pub 5-0, 13 April 1995, p. GL-1, as "operation plans in concept format."

[10] UNAAF, p. IV-6.

[11] Unites States Code, Title 10, Section 164 (c).

mobilization of reserves. Furthermore, plans and orders may be misunderstood or may not be implemented as specified due to unforeseen circumstances. Staff officers understanding the assumptions and rationale underlying a plan must continually monitor plan execution.

The unified commands stand up Joint Task Forces. The Joint Task Force is quite often the CINC's instrument of choice for prosecuting the operational level of war. Rather than theater-wide warfare as anticipated in the Cold War, crises erupt throughout the theater of operations independent of each other. The unified command may recommend a course of action to the NCA that requires standing up a JTF. If the course of action is approved, a Joint Operations Area (JOA) and mission will be assigned to a forming JTF. The JTF is responsible for creating a more detailed course of action. Forces will be allocated for execution to the new Joint Force Commander.

The unified command focuses on deployment and sustainment of allocated forces. Because the JTF is responsible for the operational level of war, it conducts tactical operations to meet theater and national strategic objectives set by the CINC and NCA. For the same reasons, the CINC and NCA retain strong interest in crisis termination—when military objectives are supplanted by political objectives. The unified command also supports redeployment of forces.

2.3 TRENDS AND CONSTANTS IN THE UNIFIED COMMANDS

Some highly successful training events and programs were established and flourished during the closing years of the Cold War, based on the training paradigm of that particular security environment. Today's armed forces face a new training paradigm. A cultural change—how to train to the new paradigm—requires a gestation period prior to full adoption of new training concepts and technologies. Because of this time lag there is a tendency to do that which we know and fall back upon what we have done before—we train this way this year because we trained this way last year. It is important to examine those things relevant to training that have changed (the trends) and those things that remain invariant (the constants).

2.3.1 The Trend from Permanent to Temporary Commands

The unified commands, as organizational headquarters, have been quite stable in the second half of the twentieth century. The Service Component command headquarters

assigned to the unified commands have similarly remained stable. These permanent organizations have decades of history working together. The specific Service units assigned to the unified commands have exhibited greater change over this same period; this is particularly true in the European theater. Even though the relationship between Service units and unified commands changes over time, the Service units themselves—maneuver divisions and fighter squadrons, for example—are enduring organizations. As another example, naval forces, due to deployment cycles, rotate in and out of a unified command's area of responsibility in the short term but are stable in the long term.

The JTF, on the other hand, is a temporary command created as a contingency emerges to conduct and control operations across a broad range of employments. The command and staff team must be built, a plan constructed, tactical forces absorbed as needed, and military operations commenced with little warning time. (Some JTFs remain operational for extended periods, but enduring and semi-enduring missions are more appropriately the domain of the unified and subordinate unified commands.) As a contingency terminates, the temporary command is stood down. Cohesion, familiarity, plans, and systems must be built on short order.

2.3.2 The Trend from Deliberate to Time-Sensitive Planning

During the Cold War, deliberate planning for general war received the preponderance of attention and resources. All the while, crisis action planning was initiated for innumerable contingencies. A culture of deliberate planning remains in many quarters. However, the unified commands have increased their emphasis on time-sensitive planning. The change is most notable at EUCOM, once consumed by deliberate planning for theater-wide warfare but now dominated by contingencies like those in the Balkans, northern Iraq, and Africa. USFK remains focused on a specific major regional contingency (MRC) supported by extensive deliberate planning. CENTCOM also plans for an MRC, but it must also be prepared to respond to a variety of lesser regional contingencies and missions in its area of responsibility.

> **Implication:** The 18-month deliberate planning process did not require training. Time-sensitive planning requires emphasis in the training program. The objective is to have as complete an OPLAN as possible in the shortest amount of time possible—just-in-time planning and training. For example, the ability to develop a TPFDD in six to eight hours would greatly enhance the planners' and decision makers' options.

Implication: Because planning and the analysis that underlies it are fundamental activities at the unified commands, planning and analysis must be trained—*train the planner*. Training, planning, analysis, and operations are inseparable at the unified command level.

2.3.3 The Trend from Theater to Independent Joint Operations Areas

Each combatant commander is assigned an *Area of Responsibility (AOR)*. The AOR assigned to a unified command is a large *theater of operations*. The AOR assigned to a subordinate unified commander or to a JTF commander is a *Joint Operations Area* (JOA). Warfare, particularly in Europe, was oriented on theater-wide and in many instances worldwide operations. Today's unified commands may have several JOAs within their theater, each JOA potentially independent of the others. The operational level of war links tactical actions to strategic objectives[12] and, quite often, the operational level of war is conducted by the JTF.

For example, separate contingencies against separate threats on the Iraqi/Saudi border and at the Straits of Hormuz may require a land-air JTF and a maritime JTF, each with its own JOA. The unified commander would assign priorities, shift resources, and otherwise arbitrate among them. Alternatively, the unified command could conduct the operation as a single contingency within the AOR.

The European theater of operations, as a second example, is partitioned into subordinate unified commands from north to south. Better known, perhaps, is the similarly partitioned NATO command structure. This partitioning existed throughout the Cold War and remains today. These are enduring command relationships. What is different in the post-Cold War era is that JOAs are carved out, JTFs created, and missions assigned and conducted independent of each other, not as part of a large war effort as was expected during the Cold War. Furthermore, the JOAs are frequently in underdeveloped countries without in-place communications, intelligence, and logistics systems.

Implication: The JOA, defined in response to a specific and perhaps unplanned contingency, may not have communications, intelligence, and logistics systems in place. Such capabilities must be built on short notice. A JOA's communications, intelligence, and logistics infrastructure cannot be assumed, and its implementation and management must be trained.

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[12] *Doctrine for Joint Operations*, Joint Pub 3-0, February 1995, p II-17.

2.3.4 The Trend from Assignment to Apportionment

The Department of Defense Reorganization Act of 1986 (the Goldwater-Nichols Act) and Title 10 United States Code require that all forces be *assigned* to a unified command. Specific forces and resources are assigned by the secretary of defense in his *Forces for Unified Commands* memorandum published annually by the Joint Staff. The respective unified command is given responsibility and authority to train those forces assigned. In general, forces are assigned where they live.

Forces and resources are *apportioned* for deliberate planning by the CJCS in the *Joint Strategic Capabilities Plan* published by the Joint Staff. CINCs are apportioned forces and resources for deliberate and CJCS-tasked contingency planning (OPLANs and CONPLANs). With the significant reduction in forces, it is increasingly common for a unit to be apportioned to more than one unified command.[13]

Forces and resources are *allocated* for execution by the NCA. This is usually accomplished via a CJCS *warning order* or *execute order* as a contingency unfolds. Unified commands may or may not have the same forces and resources allocated as they had apportioned. The decision on which forces and resources to allocate is made at the time of execution, depending on unit readiness and availability and the worldwide situation at that time.

As an example, a Maritime Prepositioning Squadron *lives* at Diego Garcia, in the Indian Ocean, may be *assigned* to PACOM, may be *apportioned* to CENTCOM, but may be *allocated* to EUCOM for a crisis action contingency. If allocated to EUCOM, it is not available for allocation to CENTCOM even though apportioned.

> **Implication:** Command elements that are apportioned to more than one unified command are being included in an increasing number of unified command exercises, at increased cost and probably with only marginal improvements in readiness. Forces should be included in unified command exercises as the exception.

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[13] Current guidance is found in *Joint Training Master Plan 1998 for the Armed Forces of the United States*, CJCSI 3500.02A, December 1996. For multiply apportioned forces, CJCS training priority guidance is that units should train to support those plans to which they are apportioned with training emphasis favoring Major Regional Contingency training over Lesser Regional Contingency (LRC) training; if apportioned to both MRCs, training should favor the earlier contingency.

Implication: Training at unified commands should focus on the unified command and Component command headquarters—commanders and staffs. These are the known elements.

Implication: Procedures between the known elements—unified command and component command headquarters—and potentially allocated forces should be simple, standardized, and joint. The unified command will have to fight with whatever forces are allocated. Service forces will have to fight for whichever unified command they are allocated. Simple and standardized interfaces should be developed based on joint doctrine and initiatives, such as joint tactics, techniques and procedures. These interfaces facilitate the needed flexibility and reduce potential component confusion.

2.3.5 The Trend from Deployed to Deployable Forces

Closely related to the issues of assigned and apportioned forces in the past, large numbers of forces were forward deployed in the theater of operations. Since they lived in a theater, they were assigned to that theater. Today's reality of fewer forces permanently stationed abroad shifts an even greater burden to strategic mobility and rapid planning and execution.

Implication: Deployment and reception, staging, onward-movement, and integration (RSOI) require even greater emphasis in the training program.

Our allies are also adjusting to the new security environment. During the Cold War, for example, German forces were dedicated exclusively to the defense of their homeland. Their need for strategic sea and air lift, deployable communications and intelligence systems, and deployable base structure ranged from minimal to nonexistent. They are transitioning to a balance between home defense and expeditionary humanitarian assistance forces with the attendant increase in the need for strategic lift and deployable systems. Involvement in operations outside of Germany alters the political reality of being host to foreign forces to one of providing forces to multinational coalitions for extra-territorial operations. Our allies are increasingly looking to the United States for strategic lift and deployable support capabilities.

2.3.6 The Trend from War to Military Operations Other Than War

Each unified command's training program contains exercises that train to MRCs and LRCs but increasingly contains exercises that emphasize and train to things that are not about warfighting. More and more, humanitarian assistance, peace operations, and other military operations other than war (MOOTW) are becoming the norm. Many of these activities do not employ the common force-on-force tactical operations but rather require M&S tools that deal with a broader range of issues, including natural and sociological disaster.

SOUTHCOM's training program has always involved operations other than war. *Training* has meant bringing reserve engineer units to Latin America to build clinics and schools after obtaining the commitment of the local government to provide teachers and nurses. It is about achieving regional stability through nation assistance. In contrast, the scenario for an *exercise* might be a multinational response to a hurricane and the objective to physically bring together officers from the several Central or South American states in one place. It, too, is about building regional stability.

EUCOM's exercise program contains several joint and combined movement control exercises, among others, in the context of the Partnership for Peace program and bilaterally with the militaries of Albania, Estonia, Latvia, and Lithuania. Other exercise scenarios focus on disaster relief requiring interagency and international support. Again, building mutual trust and regional stability is the objective. EUCOM's George C. Marshall European Center for Security Studies in Germany helps officials from the former Soviet states of Eastern Europe and Central Asia to develop national security organizations within the context of democratic societies. Again, promoting regional stability, specifically strengthening post-Cold War Europe, is the objective.

> **Implication:** These changes from war to operations other than war bring concomitant changes in the required M&S tools and applications necessary to support decision makers.

> **Implication:** An M&S emphasis on the ability to distribute the training audience is not relevant to many exercise types, particularly to many exercises conducted to promote regional stability.

2.3.7 The Constant of Small Unified Command Staffs

The staffs at the unified commands have been and remain small. Their deliberate planning responsibility remains. In addition, the unified commands' planning responsibilities have been compounded by the frequent requirement to conduct crisis action planning and to stand up and support JTFs. The result is an increase in the tempo of operations in the unified commands. Several respondents, particularly in PACOM and Korea, reported increasing use of planning and analytic capabilities located in CONUS with positive and improving results.

> **Implication:** Tools for the unified commands should be small and simple to use. They cannot require lengthy or complex data base builds, nor can they require large groups to conduct analysis or to support training. An alternative, dependent on advances in technology, is for the unified commands to remotely tap into a large data base (or even analytic capability) resident perhaps in CONUS.

2.3.8 The Constant of Planning, Analysis, and Decision Making

What remains constant throughout the Cold War to post-Cold War transition is that the unified commands are planning oriented—assessing the strategic situation, forming and evaluating alternative plans, selecting and promulgating a plan, and monitoring plan execution. The unified command's product is of the commander and staff.

> **Implication:** Training focus should be on the command and staff team of the unified command. Additionally, training focused on the collective command and staff teams of the unified and component commands should also be a priority. However, including lower echelon headquarters dilutes training focus and should be done as the exceptional case, i.e., as a culminating integration exercise.

2.3.9 The Constant of the Strategic and Operational Levels of War

The unified commands remain focused on the higher planes of warfare. Given the possibility of multiple JTFs independently conducting operations at the operational level of war in separate JOAs, there is perhaps an even greater unified command emphasis on the strategic level of war.

Implication: There is an even greater need for the M&S community to develop tools for the strategic user.

2.4 ASSUMPTIONS CHALLENGED BY THE UNIFIED COMMANDS

During our interviews the respondents postulated that many in the field operated under a variety of assumptions or misconceptions that needed to be examined. These assumptions often go unspoken and unchallenged, perhaps because "that's the way we've always done it." But since provision of cost-effective training is based on these assumptions, it is important to either verify or refute each of them. Certainly they should be challenged after the dramatic change in the operational environment following the end of the Cold War.

2.4.1 Strategic, Operational, and Tactical Echelons Can Be Trained Simultaneously

One of the most common and significant of the tacit assumptions is that decision makers at the strategic, operational, and tactical echelons can be trained equally well in a single exercise. Moreover, that single exercise is conducted in the tactical time frame. A corollary to this assumption is that *more echelons in the training audience are better than fewer*. An exercise structured to support training of tactical Service commands adapted by including higher echelon joint commands necessarily requires more echelons in the training audience, thus increasing exercise costs.

The short duration of an exercise conducted in the tactical time frame provides an excellent opportunity to integrate command elements but does not serve those whose focus is on other than current operations, i.e., the strategic decision makers and planners.

2.4.2 Component Interoperability Training Is Joint Training

Army and Air Force components in Europe developed an impressive capability to train together during the Cold War. That type of Component interoperability training, a Service responsibility, is clearly important. But joint operations, as formally defined, have a single joint force commander and staff, use joint doctrine, and employ forces from two or more Military Departments. Component interoperability training does not meet the definition of "joint." Unified commands, subordinate unified commands, and joint task forces compose the joint training audience. The unified command, subordinate unified command, and joint task force headquarters compose the joint training audience.

2.4.3 Computer-Assisted Exercises Are Conducted in Real Time

One type of computer-assisted exercise evolved rapidly during the Cold War and is the assumed standard. This type of exercise is conducted in real time and runs around-the-clock for five to ten days. Rather than employing troops in the field, in the air, or at sea, they are simulated by computer representations. The exercise employs several command and staff echelons in realistic command post environments. The exercise provides a stressful environment for decision makers and provides repetition and feedback on staff procedure execution. Procedural and information flow problems are identified. Some may be rectified during the exercise; others may require subsequent diagnosis and changes to published procedures.

There are many reasons to train in real time. One reason is neatly summarized in the catch phrase "train the way you fight." Wars are fought in real time. Another is captured in the *one third/two thirds* rule of thumb that prescribes reserving one third of a command's planning time for its own use and reserving the remaining two thirds for its subordinates' use. While it may be possible to conduct an exercise in faster than real time for a single command and staff echelon, adding a number of subordinate echelons to the training audience will require impossibly short response times from them.

In the real-time exercise, only a single path through an infinite decision space is traversed, not a serious drawback given who is being trained to do what. It is seriously deficient in training those who receive no repetition and feedback on their work. The Cold War component interoperability exercise conducted in the tactical time frame is not the only type of exercise, computer assisted or otherwise, available to train joint audiences. In fact, it appears to be a poor choice.

2.4.4 More Echelons in the Training Audience Are Better than Fewer

A corollary to previous assumptions is that a single training event including a large audience with diverse functions and training objectives is better than a series of separate exercises focused on smaller audiences. Certainly all echelons, and all functions, need to be trained. Equally certain is that once all the pieces have been trained an integrating exercise is required. What is not clear is that one exercise cost effectively satisfies all these requirements. The entire training program, not a single training event, must assure that all audiences are trained.

The Services have elaborate series of training events for their tactical units—a training program—that successively "train the pieces" and that culminate in an integration exercise. Such integration exercises are often conducted in the field with real forces and equipment, and are often externally evaluated by an independent team. As the echelon of the training audience increases, so does the cost of using larger numbers of real forces. These Service training principles are sound and can equally be applied to higher echelon joint training. The integration exercise is not the correct venue for training the pieces, i.e., the commanders and staffs of the unified commands and JTFs.

2.4.5 Modeling Shooters Is More Important than Modeling Movers

M&S developers are driven by the exercises they support, and exercises are frequently held assuming perfect lift, logistics, communications, and intelligence. The rationale is often "so that the operators won't be slowed down." These exercises certainly can be exciting for those responsible for direct combat operations, but they train unrealistically, promote unreasonable expectations, and exclude important parts of the training audience. Deploying and sustaining the force and command and control of the force are important roles of the strategic echelons.

Fighters, tanks, and aircraft carriers are near the hearts of the Services. It is not difficult to imagine why there is a desire to implement shooters first. Furthermore, simulated weapon-on-weapon engagements make for an impressive early demonstration, increasing the likelihood of continued development funding. Weapon-on-stationary-target engagements make less impressive demonstrations, and logistics flow and its transports have little glamour to recommend them. Models initially built upon weapon system engagement often cannot absorb representation of other military functions like logistics, intelligence, and communications. Separate models are often built later, thus deferring the needs of the higher echelon joint commands in favor of tactical Service units.

2.4.6 Modeling Conventional Forces Is More Important than Modeling Special Operations Forces

The Cold War focus on high intensity conflict and employment of the technologically sophisticated weapons necessary to overcome the opponent's superior numbers led to training events and M&S tools oriented on major, conventional warfare. The trend toward military operations other than war (MOOTW), among other things,

imposes a stronger orientation on unconventional warfare and a heavier reliance on special operations forces (SOF). These include specialized forces of the Army, Navy, and Air Force organized, trained, and equipped for combat operations, relatively small in numbers, as well as the large number of civil affairs forces, predominantly situated in the Reserves.

SOF is an important component of MOOTW and of spearheading establishment of a conventional JOA. Furthermore, many of the mission responsibilities of SOF have their payoff at the strategic and operational levels of war. Training events and M&S tools oriented on conventional tactical engagements are inadequate for training unified commands in the mission capabilities of special operations forces.

2.4.7 Modeling Weapons-Level Detail Is More Important than Modeling Broad, Functional Detail

Detail comes in more than one variety. It can be deep, vertical detail stovepiped from the weapon system up to the strategic decision maker, or it can be broad, functional detail across a single echelon. Weapon systems and weapon system engagements are fundamental to those who fight in them or directly command them. The value of weapon system detail to a decision maker concerned with deploying, sustaining, and redeploying a large unit is not so obvious.

There has been an assumption that adding more detail to a simulation will improve training. The limitations imposed by computer and communications technology continue to recede at a rapid rate, thus enabling the representation of greater detail. Representing ever greater detail is certainly more expensive with higher technological risk, but evidence of greater value has not been established. The pursuit of detail is relentless and expensive. Scarce resources must be carefully husbanded so that the right type and level of detail is provided for the intended user.

2.4.8 Joint Command Needs Are Met when Service Needs Are Met

The unified commands have different training needs than the Services and, correspondingly, require different M&S tools. But there is an alleged assumption that the joint commands' training needs will be met when the Services' needs are met. The assumption extends to M&S tools, i.e., if each Service has a simulation that meets its training needs, then the collection of those simulations largely or completely satisfies the

needs of the joint audience as well. The effects of the Goldwater-Nichols Act and the continuing increase on joint operations certainly argue for a top-down examination of this assumption. Service simulations tend to de-emphasize strategic operations like deployment and sustainment in favor of tactical operations, and it is those strategic operations that are of great planning and analytic significance to the unified commands.

2.4.9 Putting Aside the Assumptions and Misconceptions

The simplest expression of these assumptions or misconceptions is that satisfying the needs of Service audiences simultaneously satisfies the needs of joint audiences; and that satisfying Service M&S needs simultaneously satisfies joint M&S needs. We conclude that four guiding assertions serve to overcome the above misconceptions.

- Unified commands and JTF headquarters need joint training.
- Services need to train in a joint environment.
- Services need to train in Service environments.
- Joint and Service commands need an integrating training event.

3. HIGHER ECHELON JOINT TRAINING

3.1 JOINT EXERCISE AND TRAINING CATEGORIES

The Joint Training System[14] recognizes a fundamental shift in the training paradigm within the changed national security environment. Military training is no longer based on the demands of component-style warfare conducted in preparation for operations against a symmetrical opposing force. Rather, the joint requirements-based training system focuses on training forces for operations across major regional and lesser regional contingencies. The objective is trained personnel and ready facilities able to effectively execute joint and multinational (combined) operations.

The 1986 Goldwater-Nichols Act created a changed concept and authority for conducting joint training. Since 1986, much of the Act has migrated to public law and is now codified in Title 10, United States Code. Sections 3013 (b) and 8013 (b) task the Service Secretaries with recruiting, organizing, training, and equipping the forces assigned to the combatant commands. Section 153 provides the Chairman of the Joint Chiefs of Staff responsibility, subject to the authority, direction, and control of the president and the secretary of defense, to develop doctrine for the joint employment of the armed forces, to formulate policies for the joint training of the armed forces, and to coordinate the military education and training of the armed forces.

3.1.1 Formal Definitions

Within this context certain formal definitions taken from official joint publications must be reviewed.[15] Most important is the distinction between *component interoperability training*, a type of Service training, and *joint training*. Often component interoperability exercises, typically conducted in the tactical time frame, are incorrectly called joint exercises. Apparently only a minor semantic infraction, it is at the heart of

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[14] *Joint Training Policy for the Armed Forces of the United States*, CJCSI 3500.01, November 21, 1994.

[15] *Department of Defense Dictionary of Military and Associated Terms*, Joint Pub 1-02, March 23, 1994, and *Joint Training Policy for the Armed Forces of the United States.*

significant miscommunications. Of similar importance is the common practice of conducting joint exercises concurrently with single-Service or component interoperability exercises, forcing the joint headquarters to train in the tactical time frame.

The major training categories, according to official publications,[16] are as follows.

- **Military Training:** The instruction of personnel to enhance their capacity to perform specific military functions and tasks; the exercise of one or more military units conducted to enhance readiness or ability to conduct military operations other than war. Training has three components: *Service*, *joint*, and *multinational*. [emphasis added]
- **Service Training:** Military training based on Service policy and doctrine to prepare individuals and interoperable units. Service training includes basic, technical, operational, and *component interoperability training*. [emphasis added] Component interoperability training can be the result of either combatant commander or Service initiative.
- **Component Interoperability Training:** Operational training in which more than one Service component participates. Normally, this type of training is based on CINC-based or Service-based initiatives to improve responsiveness of *assigned* forces to combatant commanders. [emphasis added] The purpose is to ensure interoperability of combat, combat support, combat service support, and military equipment between two or more Service components.
- **Joint Training:** Military training based on joint doctrine to prepare joint forces and/or joint staffs to respond to operational requirements deemed necessary by the CINCs to execute their assigned missions. Deviations from these criteria may be made at the discretion of the respective combatant commander. For example, regional exercises focused on such CINC priorities as *coalition building*, *overseas presence and access*, *demonstrating national resolve*, and *visible support for allies* could be included in the Joint Training Plan. [emphasis added]

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[16] *DoD Dictionary of Military and Associated Terms* as modified by *Joint Training Policy for the Armed Forces of the United States.*

The following definitions are also useful.[17]

- **Exercise:** A military maneuver or simulated operation involving planning, preparation, and execution. It is carried out for the purpose of training and evaluation.
- **Joint Exercise:** Exercises based on joint doctrine and procedures that train and evaluate joint forces or staffs to respond to requirements established by joint commanders to accomplish their assigned mission(s).

These definitional distinctions are important in that they not only provide a doctrinal template and common view, but they focus resources and means to achieve the integration of Service capabilities to reach, as stated in Joint Vision 2010, full jointness institutionally, organizationally, intellectually, and technically.[18] The implications are many for M&S training tools and are discussed thoroughly in the following sections.

3.1.2 Joint Training Categories

The CJCS-approved definitions of the joint training categories are depicted in Table 1.[19] For ACOM's "tiered" training approach, see Appendix B.

Table 1. Joint Training Categories

<table>
<tr><th colspan="2">Joint Exercise and Training Categories</th></tr>
<tr><td colspan="2">Category VI
Interagency/Intergovernmental Training</td></tr>
<tr><td>Category III
US Joint Training</td><td>Category V
Joint/Multinational Training</td></tr>
<tr><td>Category II
US Component Interoperability Training</td><td>Category IV
US/Multinational Interoperability Training</td></tr>
<tr><td colspan="2">Category I
US Service Training</td></tr>
</table>

[17] *DoD Dictionary of Military and Associated Terms* and *Joint Training Policy for the Armed Forces of the United States.*

[18] *Joint Vision 2010*, pre-publication draft.

[19] *Joint Training Manual for the Armed Forces of the United States*, CJCSM 3500.03, June 1, 1996, p. I-2.

- **Category I: US Service Training.** Military training based on Service policy and doctrine to prepare individuals and interoperable units. Service training includes basic, technical, operational, and component-sponsored interoperability training in response to operational requirements deemed necessary by the combatant commands to execute assigned missions.
- **Category II: US Component Interoperability Training.** Operational training in which more than one Service component participates. This training normally includes CINC or Service initiatives to improve responsiveness of assigned forces to combatant commanders. The purpose is to ensure interoperability of combat, combat support services, and military equipment between two or more Service components. Component interoperability training can be [the] result of either combatant commander or Service initiative. When CINC sponsored, these training events should be included in the Joint Training Plan.
- **Category III: US Joint Training.** Military training based on joint doctrine to prepare joint forces and/or joint staffs to respond to operational requirements deemed necessary by combatant commanders to execute their assigned missions.
- **Category IV: US/Multinational Interoperability Training.** Military training based on allied, joint, and/or Service doctrine, as applicable, to prepare units in response to NCA-approved mandates. The purpose is to ensure interoperability of combat, combat support services, and military equipment between a single US Service component and the forces of other nations.
- **Category V: Joint/Multinational Training.** Military training based on allied, joint, and/or Service doctrine, as applicable, to prepare units in response to NCA-approved mandates. The purpose is to prepare joint forces under a multinational command arrangement.
- **Category VI: Interagency/Intergovernmental Training.** Military training based on NCA-derived standard operating procedures, as applicable, to prepare interagency and/or international decision makers and staffs in response to NCA-approved mandates.

These definitions allow for exercises that focus on joint staffs or on joint forces. Joint forces, by definition, are forces from two or more Military Departments commanded by a single joint commander with a joint staff. Therefore, both Category II and Category III exercises include training the joint headquarters. Detailed consideration of the composition of the potential training audience, based on doctrinal joint training terms, provides a better focus on the training event, who should be trained to what task, and what M&S tool is appropriate to achieve the training end state.

The training audience could be functionally oriented along a typical joint staff organizational guide or by joint or component command levels, to include all or selected staff elements, and multiple echelons of subordinate units. Functional training audiences could also consist of specialized cells such as a Joint Movement Center, a Deployable Joint Task Force Augmentation Cell, a Joint Intelligence Cell, or Joint Operations Center. In many instances, *training events consist of too many training categories and too broad a training audience.* CJCS guidance of scaling joint collective training events to a ratio of a primary training audience to supporting or secondary audiences not exceeding 1 to 1 may not be met.[20]

The two overlapping curves in Figure 3 suggest different requirements and preferences within the community. For this example, the Services have requirements to conduct single-Service training spanning mastery of basic individual military skills and unit training to Service tasks, conditions, and standards (Category I). Such unit training should in all likelihood be conducted in a joint environment to ensure the Services meet Title 10 requirements to make Service doctrine compatible with joint doctrine. In Category II, the Services have the responsibility to conduct interoperability training. The Services have shown a unilateral willingness and capability, without external pressure, to make strong efforts to meet and conduct their specific Category I and II training functions. This is particularly true between the Army and the Air Force and between the Navy and the Marine Corps. In addition, the Services, particularly Service Components of unified commands, have shown a willingness to exercise with like Services of friends and allies (Category IV).

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[20] *Joint Training Manual for the Armed Forces of the United States*, p. 5-12.

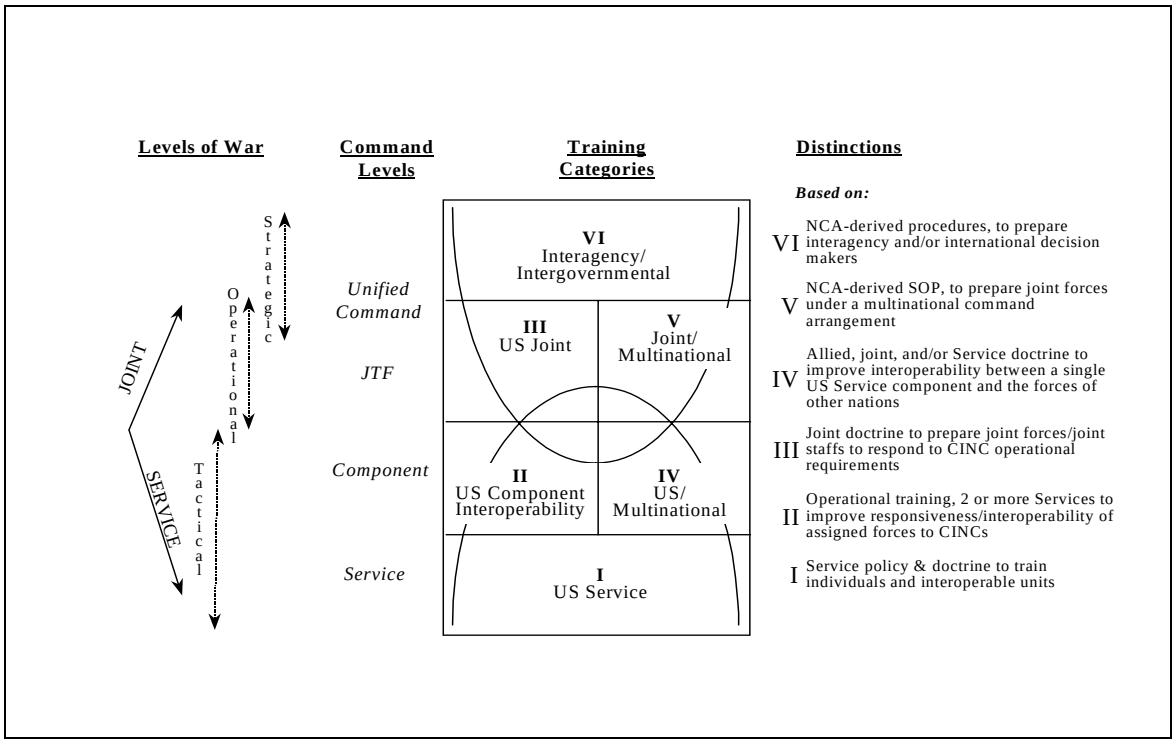

Figure 3. Doctrinal Joint Training Construct

It is not so clear that providing support for Category III, V, and VI training will naturally follow from Service interests. The unified commands have a strong interest in participating in interagency training (Category VI). The unified commands and their subordinate joint commands constitute the training audience for US joint training (Category III). The same US joint audience, when combined with the joint audiences of friends and allies, constitutes the training audience for joint multinational training (Category V). The unified commands also sponsor some Category II training events. This suggests that those responsible for future M&S development efforts could take quite different approaches to training requirements below the lower curve, above the upper curve, and in the intersection of the two curves.

3.1.3 Alternative Training Event Structures

There are a large number and a wide variety of joint exercises. The CJCS Sponsored Exercise Program is sponsored by the CJCS or combatant commanders and includes a wide range of joint exercise programs. These include the Significant Military Exercise Program, the Exercise-Related Construction Program, the Developing Country Combined Exercise Program, and the Partnership for Peace Program.

Many exercises primarily satisfy treaty obligations or presence requirements; others maintain access to host nations. Training is accomplished as a secondary objective of these exercises. The number of exercises with joint training as the primary objective is small. Of these, the real-time, week-long, multiple command echelon exercise without troops focuses training on tactical units and those elements of operational and strategic headquarters that work in the same time frame as the tactical units. Moreover, a show of force exercise is, by definition, conducted in real time with real forces. Presence may meet political objectives, but such exercises fail to stress those headquarters elements with operational and strategic decision-making responsibilities.

The study identified five structurally distinct types of training events in use: the commander and staff exercise; the commander and staff field exercise; the field, fleet, or air exercise; the wargame; and the crisis response exercise. Many real exercises share characteristics of more than one of these theoretical constructs, but most are easily identifiable as being primarily one type or another. Each exercise type will be individually characterized in subsequent sections.

The names and characterizations of the training event types described in the following paragraphs are developed solely for the purposes of this study so as not to contradict or compete with definitions in common usage elsewhere.[21]

Commander and Staff Exercise (CSX). This exercise structure is characterized as being a *skip-time, 3-day long, 8-hour per day, single command echelon, single-thread of decision, plan execution* exercise *without troops*. It is used extensively in at least three unified commands for training humanitarian assistance and disaster relief, promoting regional stability, and improving military-to-military relations. A 3-day exercise might examine days 1, 15, and 30 of a simulated contingency (skip time). A CSX is a training event focused on the needs of a commander and staff without putting the training audience in real field conditions.

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[21] Each Service and community often uses the same or similar terminology to mean quite different things. For example, a large community defines a CAX to be a computer-assisted exercise while the Marine Corps uses it to mean a combined arms exercise; some individuals use "training event" to mean a specific event, one of many that makes up an exercise, while joint publications use the same term to mean an event conducted for the purposes of training, i.e., the entire exercise. To the Army, an STX is a situational training exercise, an exercise with troops and equipment focused on a single tactical event that might later be part of a field training exercise (FTX). To the Marine Corps, STX means a staff training exercise.

Commander and Staff Field Exercise (CSFX). The premier training event for unified commands with geographic responsibility typically employ a *real-time, 24-hour per day, week-long, multiple command echelon, single-thread of decision, plan execution* exercise *without troops*. It is also the favored training event for JTF, component interoperability exercises,[22] and large single-Service exercises.[23] The number of command echelons in the training audience varies but few if any forces are deployed in the field. The CSFX focuses on the commander and staff of multiple command echelons.

Field, Fleet, or Air Exercise (FFAX). The next alternative is the field, fleet, or air exercise. The FFAX is commonly a *real-time, 24-hour per day, week-long, multiple command echelon, single-thread of decision, plan execution* exercise *with troops*. Higher echelon commands employ their real-world command and control systems. The lower tactical echelons of the training audience participate in ships, planes, tanks, etc. Real-world communications are employed to integrate the force from top to bottom and side to side. Beyond the CSX, which is focused on a single echelon of command and staff, and beyond the CSFX, which includes more than one command echelon in the training audience, the FFAX expands its focus to include tactical weapon systems and each layer of the command and staff hierarchy.

Wargame. At the other extreme, an exercise might be conducted more as an analytic process, with the clock running far faster than real time so as to span a much longer time frame. Such an exercise is a *fast-time, 8-hour per day, 1- to 3-day long, partial command echelon, multiple-thread of decision, plan development* exercise *without troops*. Time compression disallows realistic staff processes in subordinate echelons, and thus makes a large support staff both untenable and unnecessary. Only those concerned with long-term planning—the commander and principal staff—need be part of the training audience.

Crisis Response Exercise (CRX). The final alternative training event structure is a *real-time, 24-hour per day, 2- or 3-day long, single command echelon, multiple-thread of decision, plan development* exercise *without troops*. Its training focus is on the time-critical planning process. The CRX can be conducted with the unified command as the training audience. It can also be conducted with the JTF headquarters as the primary

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[22] For example, those often conducted at the Warrior Preparation Center by EUCOM's Air Force and Army components.

[23] For example, the Warfighter Exercise (WFX) of the Army's Battle Command Training Program (BCTP).

training audience focusing equally on the formation of the JTF and the time-critical planning process.

3.2 EFFECTIVENESS CRITERIA

Exercises have many objectives, particularly the exercises sponsored by the unified commands. Training may be the primary objective of an exercise, or it may be only a secondary objective. Some other important measures of exercise effectiveness are:

- Satisfaction of a treaty obligation
- Coalition building
- Gaining or maintaining access to a host nation
- Promoting regional stability
- Presence or show of force
- Visible show of support for an ally

Putting these critical objectives aside, this section develops a rationale for several measures of effectiveness for a training event specifically in terms of the training audience and training objectives. A subsequent section similarly develops cost measures.

3.2.1 Time and Command Operations

The decision horizon of the decision maker, measured in *time*, is the primary structuring device of this study. Every command post has decision makers who work toward different time horizons. Those who work on current operations may receive information, make a decision, take action, and see the results of their action all within minutes or hours. At the other extreme, planners may make decisions whose results may not bear fruit for weeks or months. Service forces tend toward the shorter-term decision cycles, while the unified commands are dominated by longer-term decision cycles. Training must recognize the duration of a command's decision cycles because *repetition with feedback* is a key component of effective training. The decision cycles of the strategic and tactical commands diverge rapidly. Rather than attempt to precisely specify the duration of the many decision cycles present in a command post, we refer to *strategic* and *tactical* time frames to distinguish between long-term and short-term time frames, respectively.

Figure 4 shows three notional command and control decision cycles that exist within higher echelon headquarters. The same cycles exist at every echelon, but their duration differs. At higher echelons, the commander and some principal staff members make decisions that don't affect the close fight for days, weeks, or months. We call the point in time at which actors' decisions affect battle outcomes their *decision horizon*. Furthermore, decisions with distant horizons stand for extended periods unless obviated. Such decisions include initiation of a new campaign or major operation, often requiring logistic movements so that forces, fuel, and ammunition are where they are needed and when they are needed to support future operations.

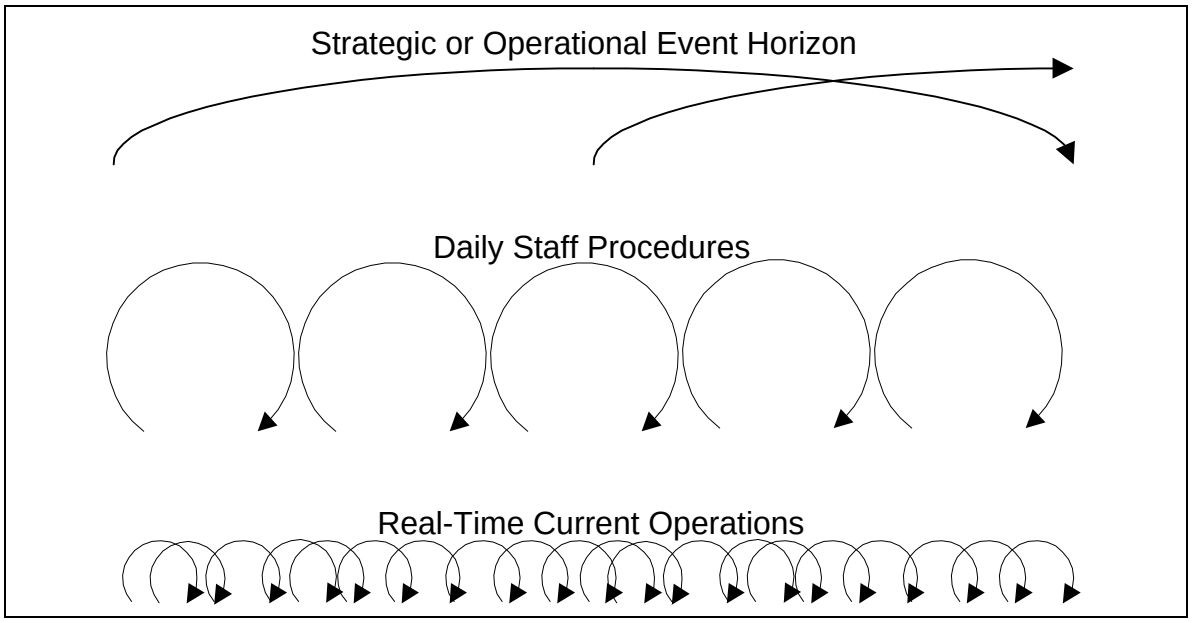

Figure 4. Headquarters Activity Cycles

Most staff procedures at all higher-echelon headquarters, whether joint or Service, operate on a 24-hour cycle. At a prescribed time in the morning, the staff assembles for the morning briefing to provide the commander with a situation assessment update and to receive the commander's guidance. Mid-day, the staff presents the commander with three broad courses of action, each of which should accomplish the commander's objectives as stated in the morning briefing. Often, the presentation will include a recommended course of action and the rationale for the recommendation. The commander makes his choice and provides additional specifics. After the meeting adjourns, the staff proceeds to analyze and plan the selected course of action in detail. The staff presents the detailed plan to the commander at the evening briefing. Upon

acceptance by the commander, the plan is promulgated throughout the command. The cycle begins anew in the morning. Between meetings, the commander is often visiting subordinate headquarters, but the staff remains at headquarters tied to the 24-hour staff procedure cycle.

At many tactical echelons, the decision horizon is 24 hours or less. The course of action might be represented by an air tasking order (ATO) or ground maneuver order. At a higher echelon, the daily course of action is more likely adjustments to a long-lived plan, for example, adjustments to personnel or logistics flows to support the anticipated future operations of its tactical subordinates.

Even the higher echelons are involved in *current operations*. Typically, a headquarters staff task organizes its subordinates and delegates close operations to them while reserving deep operations for itself. *Close* and *deep* are relative terms that certainly apply to time as well as to space. For example, at the unified command level, the strategic intelligence system may report the location of a moving, high-value target beyond the subordinate's intelligence and weapon systems range. That information is then passed in real time to weapon systems with the requisite range and capability. Furthermore, monitoring plan validity and resource-order compliance are conducted in real time and as part of daily staff procedures.

To be effective, training must provide repetition and feedback on the training audience's decisions and actions. The decision horizons of the strategic and tactical commands are orders of magnitudes apart and thus require fundamentally different training events to give both audiences equal training focus.

3.2.2 Decision Paths

Most exercises conducted in real time traverse exactly one path through the decision space. Figure 5 shows a very simple decision space that might be faced by a command. It shows that after the first course of action is chosen (CoA 3), only that course is played out in the exercise. Commander and staff conduct the analytic process of selecting between courses of action 1, 2, and 3, but only the selected course of action is executed in the exercise. Of course, many more staff decisions are made than just course of action selection, and many staff procedures are executed to support a single course of action. Regardless of the number of choices available, only a single decision sequence is executed.

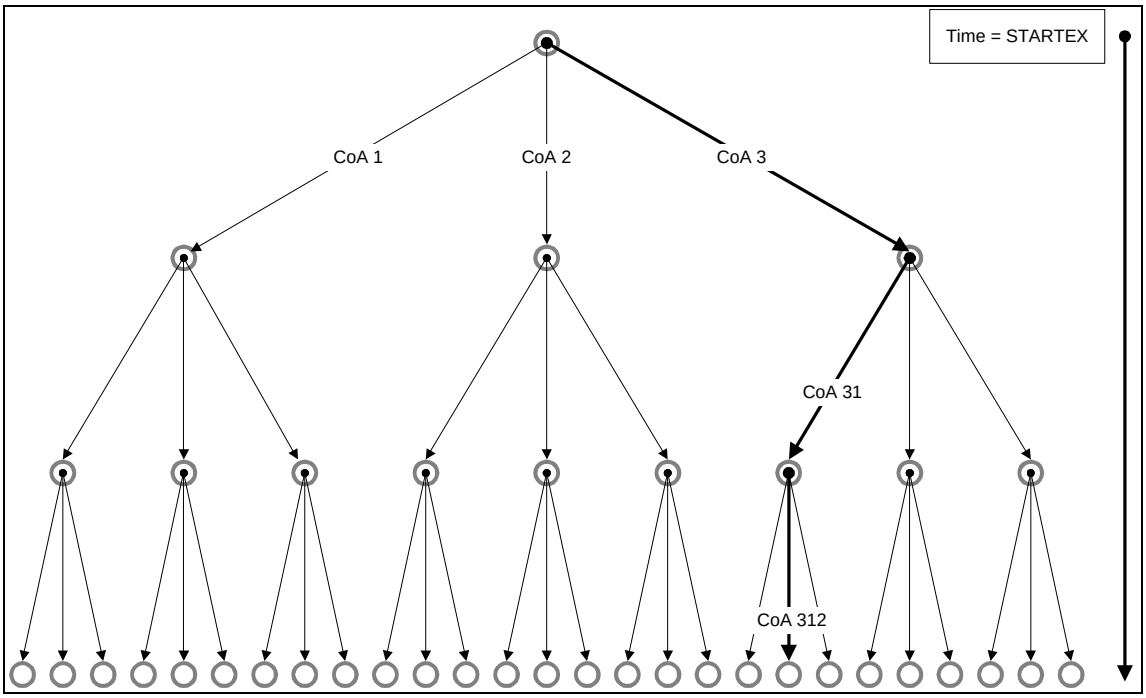

Figure 5. Single Thread Through the Decision Space

Higher-echelon commands focus more on plan development and decision making and less on plan execution. Of course, executing a plan can expose shortcomings that may not be obvious to the plan developer. However, embedding in a single exercise the development of a plan and its execution in real time severely limits the ability to assess multiple plan alternatives in a short time. Figure 6 depicts traversal of many paths through a decision space. Many plans in coarse detail—breadth—may be preferred to a single plan in great detail—depth. Therefore, *understanding breadth of actions* and *understanding a single action in depth* are both offered as possible measures of effectiveness.

The term "plan validation" is sometimes used to describe an added value of a plan execution exercise. It should be clear, however, that traversing a single path through a decision space can only demonstrate the presence of problems, never their absence. Only traversal of all possible paths, an infinite task, can show the absence of problems. Breadth of path traversal is superior to depth if *plan validation* is the measure of effectiveness.

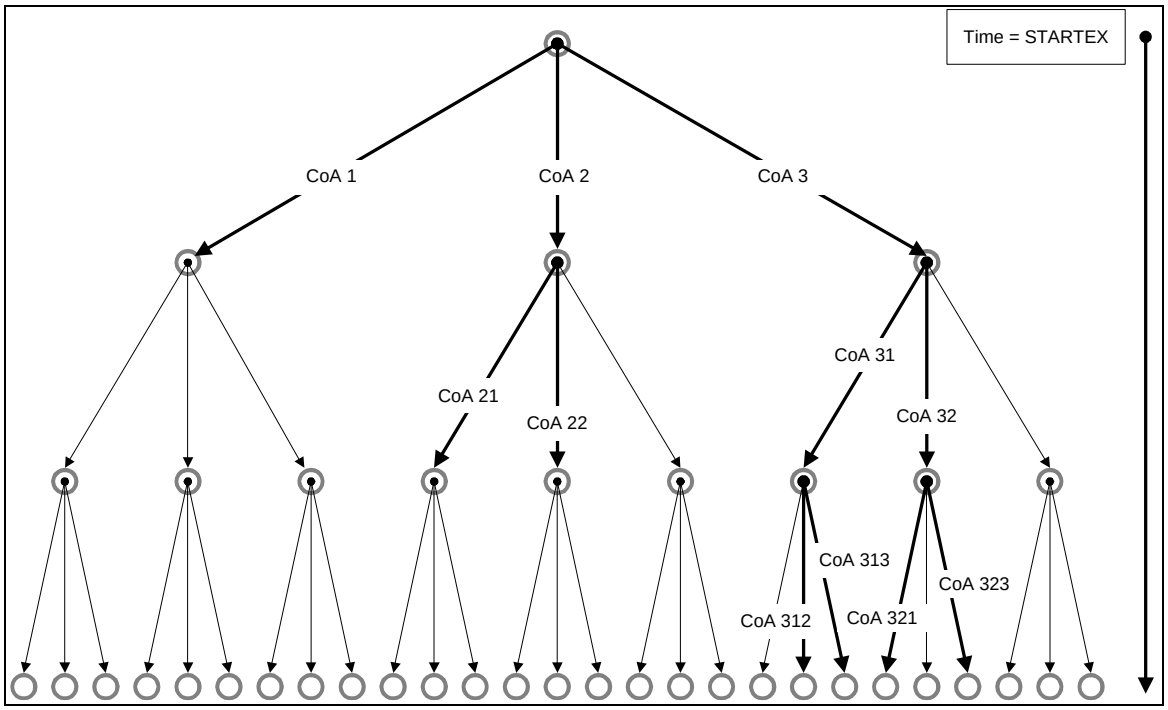

Figure 6. Multiple Threads Through the Decision Space

3.2.3 Execution of Joint Mission Essential Tasks

The current trend is to focus on the elements of the Universal Joint Task List[24] (UJTL) as training objectives. The UJTL identifies the universe of joint tasks. From this list, a subset is selected by each joint command as essential to completion of its mission, a command's Joint Mission Essential Tasks (JMETs). The individual command determines the conditions under which each task must be conducted and the standards of performance to which they must be conducted. The JMETs drive the command's training program. Successful *execution of joint mission essential tasks* must be the top-level measure of training effectiveness.

While mission accomplishment is the overall objective of the command, it is achieved through a command and control process implemented by a daunting complex of staff procedures and staff interactions. A complete set of measures of effectiveness must include measures for the command and control process, for staff procedures, and for the

[24] *Universal Joint Task List*, CJCSM 3500.04, Version 2.1, May 15, 1995.

integration of the force through staff interactions. Subsequent sections develop those candidate measures.

3.2.4 Execution of Command and Control Functions

Commander and staff interactions, and the procedures that guide them, constitute much of what is trained at the higher echelons. Figure 7 shows a simple model of the command and control process at the higher echelons, such as those commanded by a general or flag officer.[25] While the model applies equally to headquarters with a joint or general staff, the duration of the cycles varies with the echelon of its headquarters and its mission. The figure should not be read as a state transition diagram, with the command post or commander being in one state or another as represented by a single block. Instead, each block is active continuously and concurrently with all other blocks.

Mission Planning: Staff officers interpret objectives from higher headquarters or commanders to determine *what* needs to be accomplished. They propose alternative courses of action (*how* to accomplish the objectives) to the commander, and refine the commander's selected course of action according to his guidance. At a tactical echelon, the decision or planning horizon may be twenty-four hours or less. At the strategic echelon, the planning horizon may be weeks or months.

At the unified command level, mission planning refers to deployment, employment, sustainment, crisis termination, and redeployment. Forces must be deployed to a port of debarkation and then employed, i.e., moved forward into the theater of operations and integrated into the force. Forces must be sustained and protected throughout the operation. At the unified command level, crisis termination is tied to national or theater strategic objectives. At the lower echelons, mission completion is associated with military objectives, but mission completion at the higher echelons is political in nature. Redeployment planning is critical for two principal reasons. First, withdrawing a force is a complex task, possibly subjecting it to increased vulnerability. Second, with smaller numbers of units, each must be rapidly made available for other contingencies. Scarce strategic lift must be marshaled and husbanded for deployment, sustainment, and redeployment.

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[25] Figure taken from James P. Kahan, D. Robert Worley, and Cathleen Stasz, *Understanding Commanders' Information Needs*, Rand Corporation, Santa Monica, California, R-3761-A, June 1989.

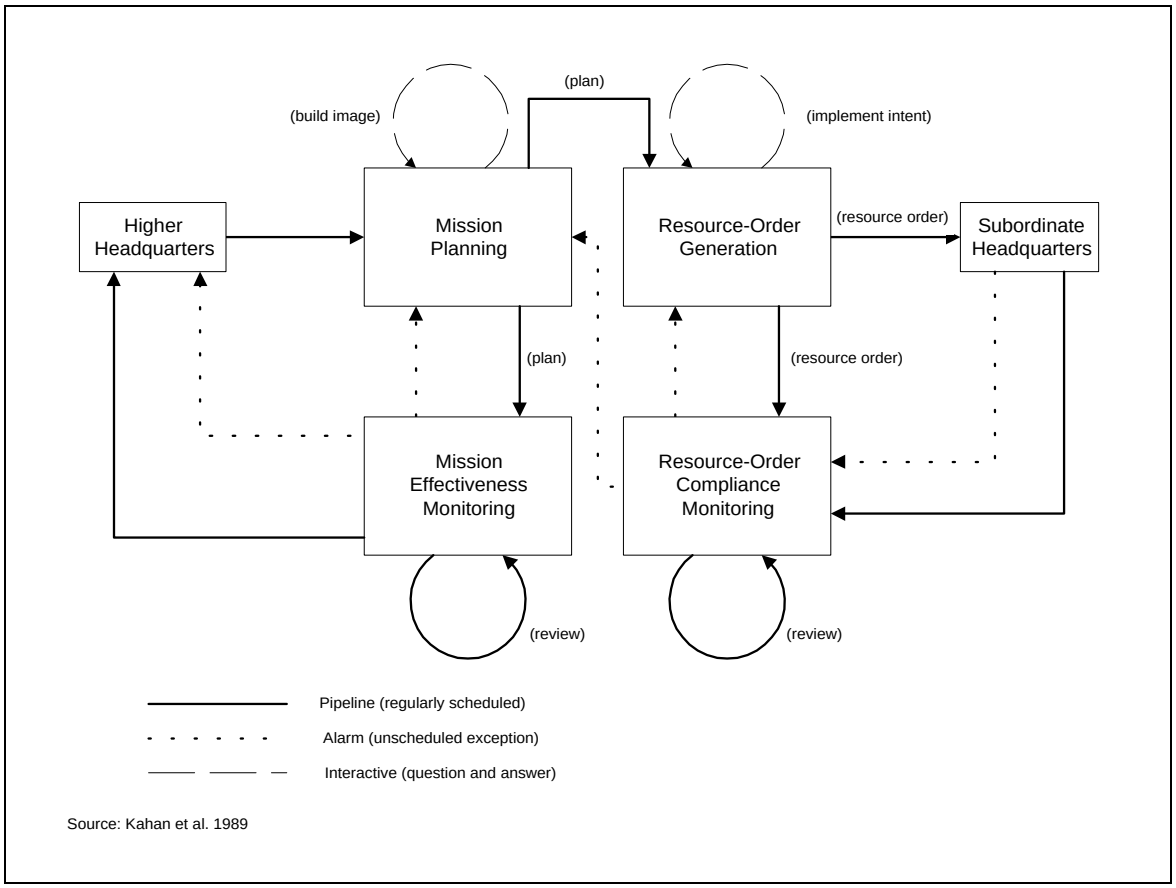

Figure 7. A Model of Command and Control

An exercise offers the opportunity for the training audience to execute the planning process. *Alternatives considered* and *repetition with feedback* for *deployment*, *employment*, *sustainment*, and *redeployment planning* are important measures of effectiveness of an exercise. *Alternatives considered for crisis termination* is another measure of effectiveness. Extreme outcomes should not take a back seat to expected outcomes in crisis termination.

Mission Effectiveness Monitoring: Mission plans can become obsolete, requiring a new plan or modifications to existing plans. The mission planning cycle may be initiated upon receipt of new orders or because the current plan has been obviated by political or military conditions not apparent when the original plan was made. Staff officers understanding the assumptions and rationale underlying a plan continually monitor plan effectiveness. When planning inadequacy is found, a new planning cycle is initiated.

An exercise that does not force the training audience through a replanning cycle does not demonstrate its ability to detect the conditions requiring a new plan nor its ability to respond in a timely fashion. An alternative is for the exercise control group to plant seeds into the simulated (or live) military operations that could threaten the extant plan and use observers to determine if the training audience detects them. Therefore, a single measure of effectiveness is suggested: *timely detection of plan-threatening conditions*.

Resource-Order Generation: Staff officers flesh out the plan and then issue resource orders and taskings to subordinate combat and support units. At the lower echelons, resource orders may be generated for operations to be conducted within the next few hours or the next day. At the strategic echelon, resource orders may require movement of forces from CONUS to a contingency area or even mobilization of reserves and the industrial base.

Resourcing the plan might be offered as a measure of effectiveness but often the optimal mix of resources is not available. Instead, *cost-effective allocation of available resources* is offered as a measure of effectiveness. Confronting the training audience with a *breadth* of resource allocation problems is as important as providing the audience the opportunity to develop resource allocation orders in great detail (*depth*).

Resource-Order Compliance Monitoring: Resource orders are issued sufficiently in advance of need so that resources—units or supplies—are in place when needed. Resource orders may be misunderstood or may not be carried out as specified due to unforeseen circumstances. A single measure of effectiveness is suggested: *timely detection of resource order noncompliance.*

The Commander's Vision and Intent: Central to all staff activity is the staff's clear understanding of the commander's vision and intent of how the mission should progress. Thus, the above mentioned measures of effectiveness indirectly measure the training audience's ability to understand its commander's vision and intent. Put another way, they measure the commander's effectiveness at communicating his vision and intent. A single direct measure, perhaps difficult to quantify, is offered. An exercise that offers the commander and subordinates the opportunity to build and share images would score high on *image proliferation*.

Backbriefs—a subordinate commander briefs his understanding of the mission back to his superior officer—are valuable tools for a commander to assess his success in

communicating his vision. A similar process might be used to measure image proliferation.

The lines connecting the rectangular blocks in Figure 7 identify the mode of information exchange that may influence the process in the receiving block. Each mode—alarm, interactive, and pipeline—is discussed in the next paragraph.

The *alarm* mode of information exchange takes place when an event occurs that obviates the extant plan. The conditions that trigger an alarm often cannot be specified in advance. Information that requires immediate attention is passed via alarm mode. After an alarm, the commander's image of the battle has been violated and he undertakes an immediate question and answer session, the *interactive* mode, to repair his image of battle before beginning a new plan-order cycle. A commander often enters into interactive mode with a subordinate not to repair a violated image but rather to assure himself that he and his subordinate are reading off the same sheet of music. Alarm and interactive modes are conducted in real time and typically require near-immediate response times. However, a plan spanning the strategic or operational time frame is not often totally discarded due to routine tactical events, no matter how unexpected. The alarm is the response to detection of a condition that might invalidate a plan or resource allocation; a measure of effectiveness has already been provided for that action.

The *pipeline* mode of information exchange represents information that is passed at regularly scheduled times through standard channels, for example, the regularly scheduled afternoon decision briefing. Routine information is typically passed via pipeline mode. Decisions are rarely made in the decision briefing. It is primarily an opportunity for the staff to assemble to hear the same information, the results of decisions, and to listen to the commander. The purpose is to achieve a common image of the battlespace. Decisions typically have been previously made in private meetings. Pipeline information flow and a large fraction of higher-echelon staffs are tied to the daily cycle. Appropriate measures are developed below.

3.2.5 Execution of Staff Procedures

Much of a command's activities are tied to a daily cycle, and much of its work is composed of routine staff procedures. Therefore, a reasonable measure of effectiveness for an exercise might be *number of repetitions with feedback of daily staff procedures.* Not all staff cells—a group of collocated specialists working collectively in a single

functional area, e.g., logistics or plans—are likely to be exercised equally. For example, operations staff cells are often the focus of a training event while intelligence, logistics, personnel, and communications staffs are secondary or background training audiences. A robust set of effectiveness measures would include identification of all staff cells, their staff procedures, and the number of repetitions with feedback of those staff procedures. Any specific exercise would not, and need not, necessarily offer the same training opportunity to all staff cells.

3.2.6 Inter- and Intra-Command Integration

Commander and staff interaction is not isolated to a single command. Commanders interact with superior, subordinate, and lateral commanders. Staff cells interact with superior, subordinate, and lateral staffs with similar functions. And within a single command, staff cells interact with staffs performing dissimilar functions. The integration of these many staff cells can only occur in an exercise that fields several staff echelons vertically and horizontally. Thus, *integration of command and staff function* must be considered as a measure of effectiveness of a training event. A single number will not adequately describe this measure of effectiveness. Evaluation of this measure requires identification of which staff cells are integrated (an integrated network) and over how many staff cycles and which staff cells are excluded.

3.2.7 Team Building

Team building is a primary objective of command and staff training. But there are many teams to be built. Some teams are oriented toward a single function and distributed throughout several echelons of command, like the intelligence team, while some are collocated and broad, like a principal staff in a single headquarters. Some teams work in the tactical time frame, and others in the strategic. An exercise that stresses one does so at the expense of the other. *Teams built* is a reasonable measure of an exercise's effectiveness—not just how many teams but which teams.

3.2.8 Training Focus

A small amount of precisely focused light can brightly illuminate a single point. The same amount of light, focused on a larger area, will illuminate less brightly. Similarly, a small amount of training resources can be focused on a small training audience with great effect. Training all elements of a large audience equally well in a

single exercise will require large resources. Thus, the measures of *integration* and *focus* work against each other. A large training audience increases the amount of integration achieved either by increasing exercise costs or by diffusing the focus on some or all elements of the training audience. Put another way, *broad focus* (perhaps a contradiction in terms) either lowers training effectiveness or increases costs.

Examples abound. In one recent exercise, the Joint Force Commander attempted to resolve a crisis through show of force and negotiation. The air component was thus denied the opportunity to plan and fly missions. A superb exercise for the higher echelon constituted lost opportunity for the lower echelon. In another recent exercise, airborne, air assault, and amphibious assault forces were all employed in a single field training exercise. Each battalion of assault forces received their training. A stressful decision-making environment for the Joint Force Commander would have included a decision to launch the operation early with only one or two elements of the assault force or to wait out approaching weather. But that would have represented a lost opportunity for the assembled element who did not participate. A final example is an Army division field training exercise. The division commander can chose to focus training on his division headquarters with some of his ten battalions occupying assembly areas in reserve, or he can conduct ten simultaneous, high intensity battalion exercises at the expense of training his command and support elements realistically.[26] This problem is manifest whether troops participate with real weapons or with weapon simulators.

A single command echelon exercise can stress internal processes well but fail to stress interfaces with other commands. A two-echelon exercise stresses the internal processes of each echelon and the interfaces between them at some additional costs. Each additional echelon added expands the set of interfaces stressed—integration—and the cost of the exercise. *Integration, exercise cost, and training focus must be carefully balanced*.

3.2.9 Summary

Several critical non-training exercise effectiveness measures were identified in the introduction to this section. Then, training-specific measures of effectiveness were

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[26] This is perhaps the reason the Army's culminating training event for divisions is conducted as a commander and staff field exercise and for battalions as a field training exercise.

developed in the remainder of the section. Table 2 summarizes these training-specific measures. In some cases, one or more secondary measures are proposed.

Table 2. Summary of Training Effectiveness Criteria

Training Effectiveness Criteria		
Primary Measures	**Secondary Measures**	
Joint Mission Essential Tasks	depth of task execution	breadth of conditions
Plan Development		
Deployment	repetition with feedback	alternatives considered
Employment	repetition with feedback	alternatives considered
Sustainment	repetition with feedback	alternatives considered
Redeployment	repetition with feedback	alternatives considered
Crisis Termination		alternatives considered
Plan Execution Monitoring		
Deployment	timely fault annunciation	
Employment	timely fault annunciation	
Sustainment	timely fault annunciation	
Redeployment	timely fault annunciation	
Crisis Termination	timely fault annunciation	
Staff Procedures Executed		
Personnel	repetition with feedback	
Intelligence	repetition with feedback	
Operations	repetition with feedback	
Logistics	repetition with feedback	
Communications	repetition with feedback	
etc.		
Command and Staff Integration	connectivity matrix of command and staff function	
Image Proliferation		
Teams Built		
Training Focus		

3.3 COST CRITERIA

To complement the measures of training effectiveness, this section develops a set of candidate cost measures.

3.3.1 Personnel Costs

Personnel costs are a significant cost driver for any exercise. They are often ignored with the rationale that Service member salaries are sunk costs, that is, they will receive their salaries whether or not they participate in an exercise or if they improve their performance. It should be clear, however, that these personnel could be productively employed elsewhere. Therefore, their presence in the exercise represents a lost opportunity cost. It is a simple matter to count or estimate the size of the training audience. Preparation of an exercise almost always produces a "manning document" that identifies all participants by name and pay grade. Additionally, any common accounting technique can be used to translate personnel days into dollar costs if desired.

Exercise support costs are also largely personnel driven. The personnel implementing the exercise control group, role players for echelons outside the training audience, the opposing force, exercise evaluators and observers, data analysts, and after action review can amount to large personnel costs. Next-generation training simulations have as a requirement the reduction of exercise support personnel.

It is impossible to assess the cost effectiveness of exercises if personnel costs—training audience and training support—are not accounted for.

High personnel tempo (PERSTEMPO) is increasingly problematic. Knowing the total number of hours spent participating in exercises, however, will not measure PERSTEMPO. The measure of interest might be of an individual's time away from home station, but this is an individual, not an aggregate, measure. An effective training program, from the PERSTEMPO perspective, would maximize training benefit while minimizing PERSTEMPO DoD wide.

3.3.2 Transportation and Communications Costs

Personnel hours are not the only cost associated with the training audience and support staff. If personnel must relocate, they receive per diem allowances for lodging and subsistence. Travel costs are often considered when commercial transportation is

required but ignored if military transportation is used. Both personnel and equipment may be required to move from home station for an exercise. Typically, C-141 airlifter hours are the driving component for strategic lift costs. Often, they are not included because the requisite flights are counted as training flights for Reserve Component flight crews. Strategic lift costs are commonly reported as total exercise costs.

Communications costs may be incurred rather than strategic lift costs. Some personnel may be able to stay at home station if communications linkages are provided. *It is impossible to make cost-effectiveness decisions if both communications and lift costs are not accounted for.*

3.3.3 Operating Tempo and Area Costs

OPTEMPO costs, typically a significant component of the FFAX, should not be ignored. When real forces are involved, fuel is burned, equipment breaks down, and ammunition is expended. Operating area, another cost driver for the FFAX, can also be significant. Operating area costs can include environmental damage caused by forces in the field or at sea, and they can include the amortized cost of training ranges or of an operational headquarters.

3.3.4 Cost Multipliers

Two important multipliers dramatically affect the cost of any exercise: the duration of the exercise and the number of echelons in the training audience. Exercise duration affects total exercise cost by acting as a multiplier for other costs including personnel, operating area, and OPTEMPO.

It should be clear that a single command echelon exercise is less expensive in terms of training audience costs than a multiple echelon exercise. Exercise support costs are also affected due to the rapidly increasing number of response cells—the human buffer between the training audience and the computer simulation—required for the larger training audience. The number of commands represented in the bottom layer of a hierarchical organization chart expands rapidly as each additional echelon is added. The number of response cells is proportional to the number of commands in the bottom layer of the training audience.

The effects of the duration multiplier are less dramatic than the additional echelon multiplier. Doubling the duration of the exercise doubles some costs. Adding one more

echelon below the primary training audience multiplies some costs by a minimum of three to five.

3.3.5 Summary

Table 3 summarizes the cost criteria of a notional exercise. It is oriented toward a typical JTF CSX or CSFX but easily can be adapted to the other training audiences and types of training events discussed in this study.

Service components —Army (ARFOR), Air Force (AFFOR), Navy (NAVFOR), and Marine Corps (MARFOR)—may be part of the primary or secondary training audience. There may be functional component audiences as well for joint special operations (JSOTF), joint force air component (JFACC), joint land component (JLCC), joint psychological operations (JPOTF), deployable JTF augmentation cell (DJTFAC), joint communications support element (JCSE), national intelligence support team (NIST), and meteorological/oceanographic (METOC) team. An opposing force (OPFOR) may be present in an exercise or it may be automated to some degree. Finally, a joint exercise control group (JECG) may be composed of one or more senior controllers and a host of observers, evaluators, data analysts, simulation support, and after action review preparation personnel. It often includes a small number of role players—e.g., from Department of State or other interagency personnel—to provide context for the training audience.

Table 3. Sample Cost Element Structure

	Cost Elements				
	Personnel Days	**Personnel Transport**	**Per Diem**	**Supplies and Equipment Rentals**	**Equipment Transport**
Primary Joint Training Audience					
Unified Command					
JTF Headquarters					
DJTFAC					
Secondary Service Component Audience					
ARFOR					
AFFOR					
NAVFOR					
MARFOR					
Secondary Functional Component Audience					
JSOTF					
JFACC					
JLCC					
JPOTF					
JCSE					
NIST					
METOC					
JECG					
Role Players					
Senior Controllers					
OPFOR					
Evaluators					
AAR Preparation					
Data Analysts					
Simulation Support					
OPTEMPO					
Operating Area					
Exercise Duration					

3.4 AN ASSESSMENT OF ALTERNATIVE TRAINING EVENT STRUCTURES

This section provides a qualitative comparison of the strengths and weaknesses of each of the five training event structures currently in use.[27] The characteristics of each structure are more thoroughly developed here after being introduced briefly in Section 3.1.3. Then, each training event structure is assessed according to the relevant effectiveness and cost criteria previously developed.

It is not a conclusion of this study that one training structure is superior to the others. On the contrary, no single structure can meet the needs of all audiences. Instead, *a training program that cost effectively trains the force is built from a complementary mix of training events whose relative strengths mesh to form a cohesive whole.*

3.4.1 Commander and Staff Exercise (CSX)

The CSX is a *skip-time, 3-day long, 8-hour per day, single command echelon, single-thread of decision, plan execution* exercise *without troops*. It is a training event focused on the needs of the commander and staff of a single command echelon that does not require the training audience to work in a realistic command and control environment and does not require large exercise support. The scenario employed is typically humanitarian assistance and disaster relief (HA/DR) or other form of MOOTW.[28]

Humanitarian assistance and disaster relief often involve a contagion such as dysentery or typhus. Treatment is preventative rather than curative, i.e., an inoculation program might be the preferred "scheme of maneuver." In addition to preventing the spread of disease, changing the public's perception of the peace-keeping force's neutrality is another major objective. The military role is often the provision of movement and logistics support as well as some capability to separate the factions through deterrence or actual combat operations. The role of non-governmental organizations (NGOs) might include the final distribution of supplies and health services as well as negotiations with the factions. The training audience's decisions do not produce changes in public perception, nor do they halt the spread of disease the next hour or even the next day.

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[27] To accomplish a quantitative assessment, a specific exercise would need to be examined.

[28] Another name for this exercise structure might well have been the HA/DR or MOOTW exercise.

In a typical SOUTHCOM exercise,[29] for example, the training audience is often a combined headquarters drawn from the several participating nations, with each nation providing a separate response cell. Participants in the exercise audience typically include NGOs as well as military. The training audience works each 8-hour day in real time, but the actions covered in the overnight simulation run might span two weeks or a month. For example, while day one of the exercise may represent day one of the operation, day two might represent day 15 of the operation, and day three might represent day 30 of the operation (*skip time*).

SOUTHCOM, EUCOM, and PACOM often employ this exercise type for coalition building and for promotion of regional stability. The former Warsaw Pact and Central Asian states can participate as allies with Western states without posing a threat to Russia. The same is true of Pacific Rim states and China. In Central America, countries with long standing historical animosity are now exercising together for mutual assistance. Training benefit may accrue, but it is not a priority objective.

The low cost of the CSX and its short duration make it possible to construct a series of exercises that allows exploration of alternate doctrine, range of coalitions, alternative command relationships, and breadth of missions. Its low cost and skip-time nature allow a day's actions to be rolled back and replayed using different decisions. Conducting the exercise in skip time allows the multinational training audience to work side by side in real time yet allows the exercise to inexpensively span a longer time period than a continuous-time exercise.

Distributing the exercise, and the training audience, is antithetical to the purpose of the exercise. Transportation costs may appear to be disproportionately high when compared to other exercise types, but *bringing people together* is the purpose of the exercise. *A distributed simulation tool is not required.*

In general, the *models of the sociologist, economist, and political scientist* support exercises employing humanitarian assistance, disaster relief, and peace operations scenarios. Traditional force-on-force combat models can offer useful tools in the form of *logistics and mobility* but, in general, require far too much operator intervention to initialize and operate. Because the training audience is small, the tool supporting the

[29] The South American and Central American Peacekeeping Operations (PKO) series.

CSX must require *few operators* to maintain a reasonable training-audience-to-training-support ratio. The M&S tool must run *much faster than real time*, perhaps 30:1.

The CSX, as defined in this study, appears to be an increasingly prevalent form of training event, particularly for MOOTW. *The CSX may provide the most versatile, least expensive, and most effective exercise for the unified commands in their promotion of regional stability and for continuing access to host nations and future allies.* While the demand for MOOTW-oriented M&S has been increasing, supply lags.

3.4.2 Commander and Staff Field Exercise (CSFX)

The premier training event for unified commands with geographic responsibility typically employs a *real-time, week-long, 24-hour per day, multiple command echelon, single-thread of decision, plan execution* exercise *without troops*. It is the preferred training event for subordinate unified commands and JTFs as well. It is also the favored training event type employed in component interoperability exercises[30] (Category II) and large single-Service exercises (Category I).[31] The number of command echelons in the training audience varies but few if any forces are deployed in the field. The CSFX includes the commander and staff of more than one command echelon in its focus, typically employs a combat scenario, and is conducted in a realistic command, control, communications, computers, and intelligence (C4I) environment. M&S is used to simulate force actions as needed to stress the training audience.

Exercise support is typically robust and expensive. A free-playing opposing force (OPFOR) is an important element in providing a stressful training environment. An exercise control group, however, retains authority over a Master Schedule of Events List (MSEL), a preplanned script, to ensure that training objectives are met. Role players provide context as echelons above the training audience. Finally, a senior controller, typically a highly regarded retired general or flag officer, intervenes to force stressful conditions. In general, M&S tools to support this type of exercise are detailed with a trend toward ever increasing detail. A layer of response cells typically buffers the training audience from the supporting M&S tools.

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[30] For example, those often conducted at the Warrior Preparation Center by EUCOM's Air Force and Army components.

[31] For example, the Warfighter Exercise (WFX) of the Army's Battle Command Training Program (BCTP).

There is some variety in how the CSFX is organized. The CSFX is effectively employed in a two-echelon format with the primary training audience composed of the unified command and JTF headquarters or composed of the JTF headquarters and its Service or functional component headquarters. The CSFX can also be employed for a training audience of three or more echelons. For this study, we arbitrarily make a distinction between the two-echelon CSFX and the large-scale CSFX with three echelons or more. Properly structured, the CSFX excels at integrating command and staff function vertically between the echelons, horizontally across staff functions internal to each command, and laterally across Service or functional components.

PACOM's *Tempo Brave* exercise series offers a good example of the two-echelon CSFX. The primary training audience comprises the unified command and the JTF headquarters. Role players represent decision makers above the unified command. Separate M&S tools are used to provide a theater-level view to the unified command and higher-resolution view of the joint operations area to the JTF headquarters.

In contrast, ACOM's *Unified Endeavor* exercise series is an example of the large-scale CSFX. The JTF headquarters, functional and Service component headquarters, and tactical Service headquarters constitute the primary training audience. Role players represent decision makers above the JTF. M&S tools provide stimulus to the lowest echelon in the training audience (tactical Service headquarters) and must necessarily be at a level of detail appropriate to that audience—weapon and sensor system interactions.

M&S tools represent force activities sometimes at two, three, or more echelons below the JTF headquarters, depending on the number of Service echelons in the training audience. Greater command and staff integration can occur when more echelons are added below the primary training audience, but each echelon added causes a great increase in exercise cost. Each echelon added diffuses focus on the needs of the primary training audience. And each echelon added below the primary training audience forces the level of detail represented by the supporting M&S tool further and further toward the tactical.

The CSFX provides *drill and practice of battle staff procedures* in tactical headquarters and those elements of operational and strategic headquarters that work in the same time frame as the tactical units. A six-day exercise provides six iterations of the daily staff cycle and provides feedback on the first five of the six days. This training event structure offers ample opportunity to diagnose (and sometimes repair) problems

with staff procedures and information flow. But it fails to train those headquarters elements with operational and strategic decision-making responsibilities.

The CSFX offers the audience the opportunity to *train to doctrine.* A single scenario is employed, including the "road to war," initial friendly and opposing force structure, and mission. Rarely are two or more solutions played out in the CSFX. The typical CSFX commonly favors operations (J-3) over personnel (J-1), intelligence (J-2), logistics (J-4), planning (J-5), or communications (J-6) issues. CSFXs with broad functional treatment of crisis response, mobilization, deployment, employment,[32] sustainment, crisis termination, and redeployment are rare.

The number of teams built expands along with command and staff function integration, but integration and team building are not the same. In a small-scale CSFX, team building and integration of several staff echelons is possible from the unified command, JTF headquarters, and joint functional components. In a large-scale CSFX, tactical Service force headquarters could also be integrated and those teams built. But the preponderance of today's Service forces is assigned to ACOM and not to the unified commands that will use them. Building a team, from CINC to troop, has great value if the team will fight together. But this is unlikely, given today's temporary JTFs and the few forward deployed forces assigned to CINCs.[33]

The value of training joint headquarters and tactical Service forces together may be less in team building and more in providing a joint environment for training Service units. If that is the case, we must ask if it is the most cost-effective way to provide that capability. More importantly, *a Category III exercise, US Joint Training, should focus on the needs of the joint audience rather than on the needs of the Service audience.*

Command and staff function integration, team building, exercise cost, and training focus must be carefully balanced as the training audience expands. Moreover, as the training audience expands across the strategic, operational, and tactical echelons, the

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[32] Employment is a word with many meanings. What is meant is determined by context. *Doctrine for Planning Joint Operations* speaks separately about strategic or national, operational or theater, and tactical employment of forces. National and theater employment are in the domain of the unified commands. The terms *reception, staging, onward movement,* and *integration* are often used to bridge the gap between forces arriving at an air or sea port of debarkation and their subsequent integration with forces in theater.

[33] This is less true for maritime theaters where Navy and Marine forces are cyclically deployed than for air/land theaters where forces are typically deployed only when allocated toward a contingency.

negative effects on training focus may be paramount and may push the intended higher-echelon primary training audience into an exercise support role.

The CSFX, for many reasons, appears to be the dominant form of training event and the driving force behind modeling and simulation requirements. *This event may provide one of the most expensive and least effective training events for joint commanders and staffs.* Its greatest value to the unified commands is as a culminating exercise that integrates subordinate forces. It also provides very effective training for tactical Service commands in a single-Service or component interoperability environment. Supporting M&S tools emphasize force-on-force combat with detailed representation of weapons, sensors, and environment.

3.4.3 Field, Fleet, or Air Exercise (FFAX)

The next alternative is the field, fleet, or air exercise. The FFAX is commonly a *real-time, week-long, 24-hour per day, multiple command echelon, single-thread of decision, plan execution* exercise *with troops*. Higher echelon commands are deployed in a realistic command environment. The lower tactical echelons of the training audience participate in ships, planes, tanks, etc. Real-world C4I systems are employed to integrate the force from top to bottom and side to side.

The FFAX can be employed for a variety of purposes. A unified command has immediate or periodic requirements to show visible support for an ally or to deter aggression. A FFAX can be scheduled on short notice to satisfy this requirement. Naval maneuvers in the Straits of Formosa or the practice of amphibious operations in South Korea require real forces. *Real people must be moved; moving electrons will not suffice.*

The FFAX can also be employed to build and maintain coalitions or to gain and maintain access to foreign bases. Again, training benefit may be of secondary value. For example, an exercise with well-trained US forces and the forces of a developing country may make great strategic sense, but the exercise must be oriented either toward the least capable force, the most capable force, or a compromise. In any case, the exercise cannot be optimized for all parties concerned. Again, training focus is compromised.

When training is the primary objective, the FFAX is properly called a field training exercise (FTX). It is a common and arguably the preferred form of training for single-Service (Category I) or Service interoperability (Category II) training at the small, tactical unit level. For example, Army and Marine battalions or multi-ship air missions

benefit greatly from such training events. At this echelon, the FFAX is the culminating training and evaluation event.[34] Multinational, single-Service exercises (Category IV) are often conducted as FFAXs as well.[35] When the primary objective of a FFAX is training, it is often conducted at sea or at an instrumented training range in CONUS or in a well-established theater of operations, e.g., Europe or Korea. OPTEMPO costs are high. Due to the high costs of operating area (instrumented training range), costs must be shared by many, and transportation to and from home station can be considerable. *Instrumentation and the associated support tools are the principal M&S requirements.*

Another successful variant of the FFAX is conducted with networked simulators (e.g., crewed aircraft or tank simulators) to great effect. This variant makes a significant contribution by greatly reducing OPTEMPO and operating area costs of the FTX on an instrumented range. The low cost of a simulation center based on simulators (relative to an instrumented range) makes it more likely that major Service installations could maintain their own virtual FFAX capability. Linking these simulation centers via communications enables Service exercises and Service interoperability exercises at reduced transportation cost and travel time. Instrumented training ranges and networked simulators can be linked into "virtual training ranges." Networked tank and aircraft simulators do not obviate the need for physical training ranges and real weapon systems, but they offer an attractive, low cost element to the nation's training range mix.

The FFAX is an extension of the CSFX carried to its logical extreme. It includes echelons of command and staff as well as tactical forces at sea, in the air, and on land. The large-scale FFAX—with training audience spanning CINC to troop—magnifies the advantages of command and staff function integration, while compounding the shortcomings of the large-scale CSFX, specifically cost and diffusion of training focus. The large-scale FFAX is clearly the most expensive training event type possible. In general, *it either sacrifices effective training of the higher echelon audience for the tactical, or it ineffectively uses troops as training aids for the higher echelons*.

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[34] For example, a tank or mechanized infantry battalion's rotation at the National Training Center (NTC), Fort Irwin, California.

[35] For example, the navies of several countries conduct combined fleet operations in the Pacific, and the US and Thai Marines conduct combined amphibious exercises.

3.4.4 Wargame

At the other extreme, an exercise might be conducted more as an analytic process, with the clock running far faster than real time so as to span a much longer time frame. Such an exercise is a *fast-time, 1- to 3-day long, 8-hour per day, partial command echelon, multiple-thread of decision, plan development* exercise *without troops*. This type of exercise focuses on those individuals concerned with long-term decision making and on the planning process.

We use the term "wargame" to include what are variously called seminar wargames, analytic wargames, and planning exercises. The wargame replicates activities conducted by unified command staffs for a wide range of purposes. For example, decision support for the CINC, strategic estimates, and crisis response are all analytic processes involving the same staff and the same analytic tools. In this process, the execution of military operations is modeled or simulated in much faster than real time, but the staff (training audience) works in real time. Time compression disallows realistic staff processes in echelons below the primary training audience, and thus makes a large support staff both untenable and unnecessary.

The unified command's commander and principal staff must think, plan, and act in the strategic time frame. A geographic unified command (the supported command) must incorporate the range of capabilities of the functional unified commands (the supporting commands) as well as the capabilities of its Service components. The capabilities that are offered by the supporting commands have payoff in the strategic and tactical time frames. A real-time, tactical time frame exercise does not offer the appropriate training environment for the strategic decision maker and planner.

The objective of strategic decision makers is to produce a robust plan that can stand up to the fog of war that surrounds their work. To produce a robust plan, the appropriate exercise requires generation and consideration of several courses of action, consideration of what might defeat a course of action, and the attendant wargaming of those courses of action. They require exploration of many paths throughout the possible decision space, i.e., branches and sequels.

The appropriate training environment is offered by a wargame. Such an exercise can be conducted in any of several formats, but regardless of format, the analytic process and supporting tools underlie this type of exercise. The entire training audience might comprise the command's principal staff and commander. The physical setting might be

as simple as a round table. Alternative courses of action are generated and submitted for evaluation to analysts employing analytic M&S tools. The outcomes of military operations are determined in much faster than real time. Each course of action is subjected to a "what if" process. Many different scenarios with a breadth of missions could be considered.

Rather than a single scenario, the wargame allows consideration of several scenarios. Several alternative force deployments may be given equal consideration. For example, issues like heavy versus light forces, air before ground forces, or combat service support forces before combat forces may all be considered in equal detail. A scenario may be played that assumes a viable foreign internal defense program was in place prior to hostilities; then the same scenario may be replayed without that assumption. The role of exercise control is often paramount, particularly when the purpose of the exercise is to keep the audience on the horns of a dilemma. The senior controller is responsible for generating meaningful "what if" conditions rather than relying on an M&S tool.

The wargame also may be employed to train for crisis response and crisis termination. It could be used as part of the process of developing a theater's strategic vision, including the relationships between supported and supporting commands. Each JTF formed is unique and this type of exercise could be used to explore the relationship between each JTF and the unified command.

The wargame, in its various forms, was once an extremely popular training event structure, but it fell into disuse, as computer-assisted exercises became computer-driven exercises. One reason could be the Cold War reliance on the lengthy deliberate planning process at the unified command level. Another reason may be the prevalence of and reliance on the large-scale CSFX. A final reason might be postulated that whenever a commander is asked about his training needs, he talks about training his subordinate commands rather than about training himself and his immediate team, thus leaving a training vacuum at the senior commands. Who is responsible for training the CINC?

M&S tools serve a different purpose in the wargame than in the CSFX. In the CSFX, the M&S tool must adjudicate military operations and produce a *single plausible outcome* that could quite conceivably be overturned by the exercise control group to meet training objectives. For the analytic process, the M&S tool should provide a *distribution of outcomes* that are more representative of the range of possible outcomes rather than a single plausible outcome.

The wargame allows the audience to *explore unknowns* rather than to *train to doctrine*. *The wargame may provide one of the least expensive, most flexible, most focused, and most effective training events for the joint commands.*

3.4.5 Crisis Response Exercise (CRX)

The final alternative training event structure, the crisis response exercise, is a *real-time, 2- or 3-day long, 24-hour per day, single command echelon, multiple-thread of decision, plan development* exercise *without troops*. The CRX, while sharing many attributes with the wargame, is discussed separately in this study. It focuses on the JTF and its tools.

The unified commands are required to provide a recommended course of action within 48 to 72 hours after receipt of a warning order from the NCA. They must generate alternative courses of action, evaluate them, and make their recommendations. One or more of the alternative courses of action might include formation of a JTF. Once formed, the JTF must take the plan proposed by the unified command and transform it into a more detailed plan through the same crisis action process applied at the unified command. Thus, crisis response is a function of both the permanent unified commands and the temporary JTF headquarters, and each command might conduct separate or connected crisis response exercises.

The unified commands are increasingly required to form JTFs in response to contingencies. Today's JTF headquarters is formed from component headquarters, not from a joint headquarters. It is typical for the CINCs to designate one or more JTF structures formed from each of its component commands. This typically includes a commander, normally at three-star level, and selected staff. In addition, the theater commands typically designate a single core group to be available during crisis response and to be shared by all designated JTFs.[36] Finally, "plugs" (selected staff from the various components other than the dominant component) augment the commander, staff, and core, as the contingency requires.

The focus of the CRX is on training the planning process and team building. The team building aspect is particularly important for the JTF headquarters, which typically does not work together. Similarly important for the JTF is the need to train on the real-

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[36] "Deployable JTF augmentation cell" (DJTFAC) is becoming the de facto standard term for this core.

world C4I tools used by joint headquarters that are not commonly used by the components. For such an exercise, a real-world command post with real-world C4I tools is the desired facility—a joint operations center. Modeling and simulation tools would *stimulate* the C4I tools directly or indirectly through a response cell.

The crisis action process would take place at this facility. The team would be built and staff procedures ironed out. If the exercise is at the front of a real contingency, then the joint operations center could become the home base for the JTF headquarters. The entire JTF headquarters could move forward to its joint operations area, or a forward element would deploy forward and "reach back" to the joint operations center for services, reducing the JTF's forward footprint.

The facility to support this type of training, or this type of operation, is a real joint warfighting operations center, equipped with the real-world distributed planning and analysis tools available to the Joint Planning and Execution Community, fed by real data sources for operations or *stimulated* by simulations for exercises. The crisis response exercise or, more correctly, the facility to support it, appears to be of great current interest to the unified commands. The facility is a significant departure from simulation centers constructed and operated specifically for training.

Rather than a stand-alone training simulation, the simulation requirements would be derived directly, top down, from the JTF's real-world C4I tools and be an integral part of the C4I system.

3.4.6 Summary

Joint exercises are not necessarily training events. The unified commands are tasked with a variety of responsibilities, including satisfying treaty obligations, building bilateral and multilateral coalitions, maintaining military-to-military relations, gaining and maintaining access to host nation support, promoting regional stability, providing a visible show of force or support for an ally, and training. Put another way, some exercises directly accomplish a CINC's assigned mission, while others train to accomplish a possible future mission. *The Chairman's and CINCs' exercise programs cannot and should not be evaluated in terms of their joint training value alone.*

Table 4 summarizes the characteristics of the five alternative training event structures.

Table 4. Characteristics of Alternative Training Event Structures

Characteristic	CSX	CSFX	FFAX	Wargame	CRX
Time	skip time	real time	real time	fast time	real time
Duration	3 days	5 – 7 days	5 – 7 days	1 – 3 days	2 – 3 days
Hours/Day	8	24	24	8	24
Command Echelons	single	multiple	multiple	partial	single
Threads through Decision Space	single	single	single	multiple	multiple
Plan	execution	execution	execution	development	development
Troops	without	without	with	without	without

A small-scale FFAX is a cost-effective way of implementing many of the unified commands' objectives. A small-scale FFAX employing engineer units to build schools or clinics may be the best and least expensive method to promote regional stability and maintain access. Small unit, single-Service, multinational FFAXs may be the best and least expensive way to maintain military-to-military relations and build coalitions.

Neither the small-scale nor the large-scale FFAX is an effective means to train a joint audience, and certainly not for training those individuals responsible for strategic and operational decisions.

The CSFX cost effectively accomplishes command and staff integration and provides an excellent opportunity for training staff procedures. The CSFX offers the opportunity to execute a single plan for a single mission in great detail. It offers several days of drill and practice of staff procedures. However, it offers no opportunity to explore multiple paths through the decision and outcome space. Moreover, there is an opportunity for consideration of only a single mission. The CSFX provides a poor training opportunity for decision makers at the strategic and operational levels. As echelons are added to the training audience, the number of command and staff functions integrated increases dramatically, as do exercise costs. Focus on any specific echelon is inversely proportional to the number of echelons in the training audience.

The cost of a large-scale CSFX, relative to the large-scale FFAX, is lower due to the replacement of troops in the field with computer simulations. But simulated forces do not meet CINC's presence objectives.

The CSX cost effectively accomplishes CINC missions and trains MOOTW. Like the FFAX, the CSX oriented on MOOTW inexpensively meets the unified commands' objectives for promoting regional stability, maintaining access to host nations, and improving military-to-military relations. In summary, the CSX is excellent for promoting political-military relations, building coalitions, promoting regional stability, exploring alternative MOOTW doctrine, exploring a breadth of missions, exploring multiple decision paths, and stressing strategic and operational decision makers. Its costs are modest and it maintains a sharp focus on a single command echelon, possibly combined, audience. It is, however, poor at integration of command and staff function through real C4I systems and poor at total force integration.

The wargame cost effectively trains long-term decision makers and planners. The joint commands perform a critical planning function through which Service forces and capabilities of supporting unified commands are integrated and synchronized. The wargame best focuses attention on the joint audience. In its various forms, the wargame focuses on training the planning process and supporting strategic estimates. It also spans the strategic time frame and the unified commands' broad strategic responsibilities for deployment, employment, sustainment, crisis termination, and redeployment. The command team is provided a broad range of contingency situations and, through wargaming, has the greatest opportunity to observe and understand its commander's needs. However, it does not offer the opportunity to integrate several command echelons, nor does it offer an opportunity to monitor plan execution.

The CRX cost effectively trains JTF formation and crisis response. The CRX also trains the time-critical planning process and use of real-world planning tools. It maintains a tight focus on a joint audience. Like the wargame, the CRX does not offer the opportunity to integrate several command echelons or to monitor plan execution.

4. FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

This chapter begins with a brief review of some of the study's more important findings as developed in earlier sections. The review is followed by a more detailed discussion of the effects of those findings. Finally, recommendations are made for both joint training and for M&S tools to support joint training.

4.1 FINDINGS

The unified commands develop plans. The unified commands integrate and synchronize forces to execute assigned missions. This role is implemented through plan development. A wargame or crisis response exercise supports planning with multiple option and resource tradeoff comparisons. Exercises framed in the execution of plans, in contrast, do not offer the opportunity to consider the breadth of missions that might be confronted in a theater over time, nor to consider alternative plans for a single mission.

The unified commands monitor plan execution. During military operations, often conducted by JTFs, the unified commands monitor plan execution. In addition to developing plans for deployment, employment, sustainment, and redeployment, the unified commands monitor the execution of plans to adjust, for example, personnel and logistics flows. The unified commands also retain a strong interest in crisis termination.

The unified commands stand up JTFs. The geographic unified commands consistently cited JTF creation and training as an important responsibility. The JTF has become the major subordinate operational command of the unified command, altering the relationship between the unified command and its components. The JTF's temporary nature and crisis response posture imposes a very different training challenge than training a standing organization with a standing plan.

The joint commands are responsible for the strategic and operational levels of war. Even the strategic level of war entails quick decisions with immediate consequences. The unified commands retain responsibility for national and theater intelligence and weapon systems. Even though the unified commands have a

responsibility for decisions and systems in the tactical time frame, they retain a host of higher-level, longer-term responsibilities.

Training is oriented on component interoperability. The respondents to our interviews concentrated on training their subordinates—their components and potential JTFs—and not on the unified command itself. The staff of the unified command, and sometimes the commander, participates in such exercises, and may even be designated as the primary training audience. However, the exercise, typically conducted in real time, stresses staff procedures and staff interactions at the component level and below.

Training is conducted primarily in the tactical time frame. The premier training events conducted by theater commands typically employ a *real-time, week-long, 24-hour per day, multiple echelon, single-thread of decision, plan execution* exercise *without troops*. This is true of unified regional command and joint task force training. However, this type of exercise does not span a sufficient time frame to demonstrate the value of those actions designed to produce operational or strategic effects. Therefore, only the tactical effects become known, excluding the preponderance of unified command actions.

Training begins when the first simulated shot is fired. The typical exercise, conducted in the tactical time frame, begins when the first shot is fired and spans perhaps the first major engagement. But getting there is half the battle, and significant functions of the joint commands occur prior to and subsequent to the shooting war. Mobilization, deployment, strategic and operational employment, sustainment, crisis termination, and redeployment are almost entirely excluded from the typical exercise. Some very useful joint exercises might well *end* rather than *begin* when the first shot is fired.

4.2 CONCLUSIONS

4.2.1 Effects of Training in the Tactical Time Frame

Figure 8 depicts the relationship between strategic functions to be trained and those functions trained in the tactical time frame exercise. The typical exercise offers the unified command the opportunity to train its commander and staff in monitoring tactical operations, including tactical employment and sustainment of the force during tactical employment. The typical exercise also stresses the use of strategic communications, intelligence, and weapon systems. The same exercise excludes from training the strategic

functions of deployment, strategic and operational employment, and redeployment of forces and of communications, intelligence, and logistics infrastructure. Crisis response and crisis termination are also excluded from the exercise.

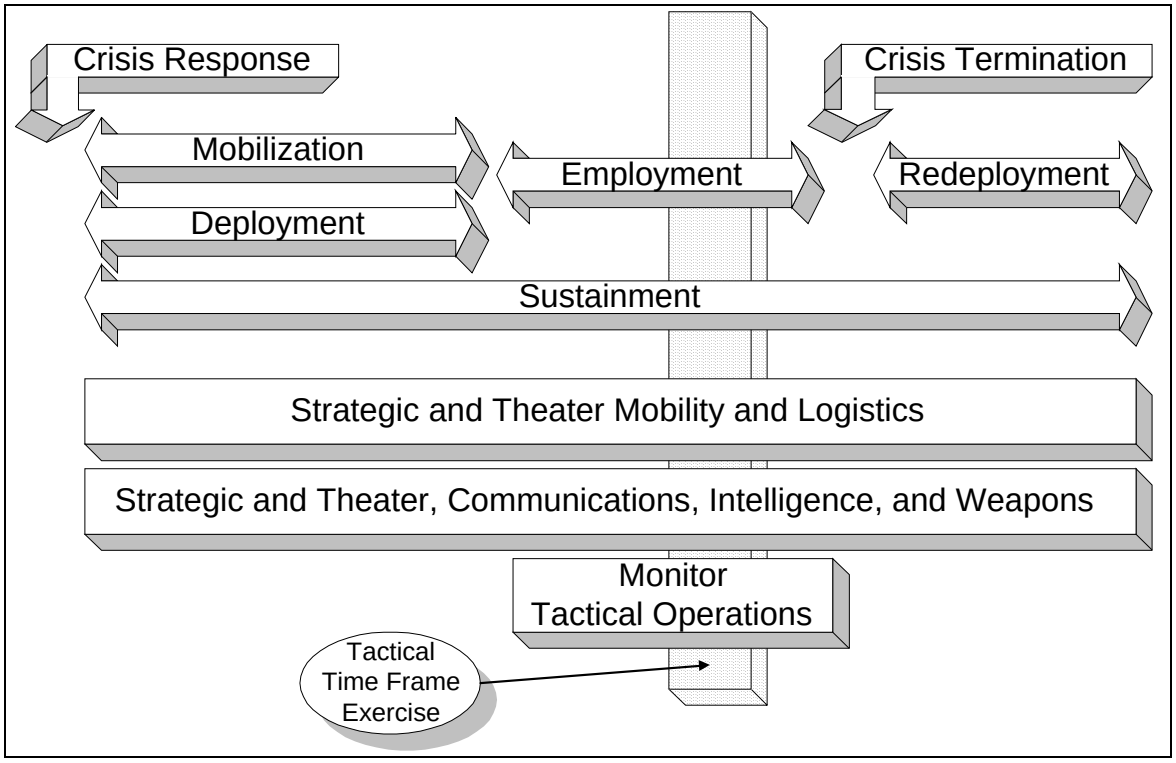

Figure 8. Strategic Functions and the Tactical Time Frame Exercise

Strategic decision makers and planners are excluded. At higher echelons, those concerned with current operations may be *over exercised*, those working within the 24-hour staff procedure cycle *well exercised*, and those responsible for planning to a distant decision horizon nearly *excluded from the exercise*. Thus, excluded from the exercise are those whose functions make the joint force perform differently than just a collection of tactical forces, e.g., what makes a corps more than just three divisions, a fleet more than the resources of its type commands, an air force more than just several wings, a marine expeditionary force (MEF) more than a supported division and aircraft wing, and a joint force more than the sum of its Service forces.

Strategic outcomes are excluded. In the typical theater command's exercise, special operations force (SOF) play is purely tactical, for example, the effects of direct actions and special reconnaissance missions. SOF units conduct small-unit, tactical actions designed to produce either tactical, operational, or strategic effects. The majority

of SOF missions involve psychological operations, foreign internal defense, counter-terrorism, counterproliferation, and information warfare. However, the real-time exercise does not span a sufficient time frame to demonstrate the value of those actions designed to produce operational or strategic effects. Therefore, only the tactical effects become known, excluding the bulk of SOF missions.

The problem is not unique to SOF capabilities. Air power can be employed to achieve tactical, operational, or strategic effects. Close air support, air interdiction, and strategic bombardment are obvious examples. Army airborne operations and Marine Corps amphibious operations can be conducted to seize airports and seaports. While these operations certainly have tactical outcomes, their true value is at the operational or strategic levels. A week-long, real-time training event can only show tactical outcomes. A much faster than real-time, multi-threaded exercise is required to allow the command to determine the longer-term effects of these operations, i.e., what are the strategic implications of failing to seize a port? What conditions might warrant a change of plan?

Optimal training does not occur because the commander and staff do not have the opportunity to receive feedback on their operational and strategic decisions.

Strategic capabilities are not fully exploited. Exercises conducted in the tactical time frame just do not last long enough to bring to bear the many national- and theater-level resources provided to the regional commanders (the supported CINCs) and the functional commanders (the supporting CINCs). Quite often, the commanders and their staffs have not had the opportunity to train together in their battle staff positions and have not had the opportunity to understand the capabilities and limitations of their fellow CINCs' staffs and resources.

SPACECOM, for example, provides an enormous combat multiplier, but it takes time to determine what assets should be employed, where, and how. The time to determine employment of such capabilities—strategic employment—is *before* combat operations commence, yet most exercises begin with combat operations. TRANSCOM's capabilities for deployment, sustainment, and redeployment are critical. Yet, quite often, all the training audience is able to learn to appreciate are small snapshots of capability based on the window of time a tactical exercise encompasses. Strategic capabilities, such as those provided by SPACECOM, STRATCOM, SOCOM, and TRANSCOM should have been considered and tradeoffs made as part of a plan development or pre-execution exercise.

Optimal training does not occur because the supported CINC and staff do not have the opportunity to make capability tradeoffs with the resources provided by the supporting CINCs and the supported CINC's Service components.

Extending the duration of the real-time exercise is not a practical alternative. One costly alternative is to extend the duration of the real-time, multiple echelon, plan execution exercise to span the appropriate time frame. This alternative has several obvious drawbacks that exclude it from further consideration. The training audience commander and staff simply cannot devote the time required. And, in all likelihood, a very long exercise cannot maintain the necessary audience attention.

After a week of staff drill and practice, those tied to real-time operations and the 24-hour decision cycle have been adequately trained. The marginal training value of each additional week of drill and practice can be assumed to be very small. However, the marginal training value to those responsible for the long-term decision processes affecting operational and strategic outcomes remains high even after several weeks.

Even in an extended duration real-time exercise that spans an operation from crisis response to redeployment, only a single path is traversed. A multiple thread exercise conducted in much faster than real time better meets the needs of the unified commands.

Strategic time frame exercises are needed. Thus, the first problem to solve is provision of training events that span a time frame sufficient to stress the joint audience's strategic and operational functions. All phases of operation must be trained, from crisis response to redeployment, although not necessarily in a single exercise.

Exercises focused on pre-execution planning should train the joint audience's ability to quickly tailor the many resources provided by the theater CINCs' Service components and the supporting CINCs into a JTF for a wide variety of contingencies. It is the planning process that is being trained.

Exercises focused on execution must span a time frame sufficient to allow observation of the strategic and operational effects of tactical actions. The exercise should produce a distribution of outcomes, e.g., the outcome with and without foreign internal defense capabilities or the outcome with and without successful port seizure.

An over-reliance on training in the tactical time frame has as its consequence a training shortfall at the strategic and operational level of war—the domain of the joint commands.

4.2.2 Effects of Multiple Command Echelon Training Audiences

Too many echelons in the primary training audience—particularly when some echelons operate in the strategic and operational time frame while others operate in the tactical time frame—invariably lead to some echelons being shifted out of the primary training audience and into the secondary training audience or, in the worst case, into a training support role.

Too many echelons in the training audience results in a diffusion of training focus. There are two extremes, both of which prevent cost-effective training. At one extreme, the higher echelon, designated the primary training audience, may succeed at the expense of the lower echelon audiences who serve as training aids for their superiors. This is a well-documented result of large field exercises in the 1940s through the 1970s,[37] and led to the following well-known rule of thumb. Its applicability is not limited to field training exercises, applying equally well to commander and staff field exercises.

> The benefits from a field training event extend to units two levels below the highest headquarters participating.[38]

At the other extreme, the higher echelon, confronted with the large lower-echelon training audience that comes with a multiple echelon exercise, becomes the orchestrator of many simultaneous lower echelon exercises. Tradeoffs are made to achieve the greatest benefit for the large, lower-echelon audience at the expense of the small, higher-echelon audience. At this extreme, the tail wags the dog.

Both of these pathologies are easily avoided by minimizing the number of echelons in the training audience. But something is lost in the single command echelon exercise—integration of command and staff function.

Identifying the right training audience for an exercise must balance contradictory cost and effectiveness objectives—audience integration versus training focus.

Simply designating the highest echelon as the primary training audience does not by itself make that echelon the primary beneficiary of training. The exercise must be

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[37] *Common Sense Training*, Lieutenant General Arthur S. Collins, Jr., US Army (Ret), Presidio Press, Navato, California, 1978, pp. 146-149.

[38] *Ibid*., p. 146.

designed to focus training benefit on the desired primary training audience, just as a physical exercise focuses on a specific muscle group.

Different echelons work toward different decision horizons. Dealing with the time dimension of the various decision makers is problematic in a multiple command echelon exercise. At the lower echelons, time is measured in minutes and future operations in hours. At the next echelon of command, what were minutes at the company turns into hours at the squadron, regiment, MEU, or brigade. Future operations might be measured in multiple hours. At the division, current operations are measured in hours and future operations measured in days.

However, at the corps and MEF levels, for example, time stretches out and the linkage of simulation support to the conduct of exercises becomes tenuous. At the joint task force and unified command level, time and decision horizons are well beyond the realm of the real-time, tactical time frame exercise.

A superb exercise for one training audience is anathema to another when the two work towards incompatible decision horizons.

Training joint commands using many echelons in the training audience requires a lower echelon model and vice versa. The lowest echelon in the training audience in a computer-assisted exercise communicates with a response cell, which in turn communicates with the supporting M&S tool. Hence, the M&S tool must simulate the actions of forces below the lowest echelon in the training audience. In a single command echelon exercise, the lowest echelon in the training audience and the primary audience are one and the same, and the *semantic gap* between the actions carried out in the M&S tool and the primary training audience is small. If the number of echelons in the training audience is large, then the semantic gap between the actions carried out in the simulation and those of concern to the highest echelon in the training audience is large. The gap is especially large if the lowest echelon is tactical and the highest echelon is operational or strategic.

The real-time plan execution exercise offers adequate opportunity to monitor plan execution over the duration of the exercise, about a week's time. M&S tools that support a tactical training audience, in fact, require a tactical training audience to aggregate the information for successively higher echelons until it is at the appropriate level of detail for the unified command. Such an M&S tool is clearly more expensive to develop and to operate than a tool calibrated specifically for the unified command. In addition, such a

tool requires an expensive exercise with a large training audience to stress the unified command. Still, it stresses only a fraction of the higher-echelon joint training audience's responsibilities.

Figure 9 depicts three notional types of simulations. Each simulation is calibrated to the decision horizon of an audience. Actors whose decisions are made in real time and whose information needs require weapon- and sensor-system level of detail require an appropriate simulation. Those actors whose decisions are part of a 24-hour decision cycle do not require such a detailed simulation. Those actors whose decision horizon is beyond real-time current operations and the 24-hour cycle require a much less detailed simulation, one that runs much faster than real time and produces a distribution of outcomes in broad strokes.

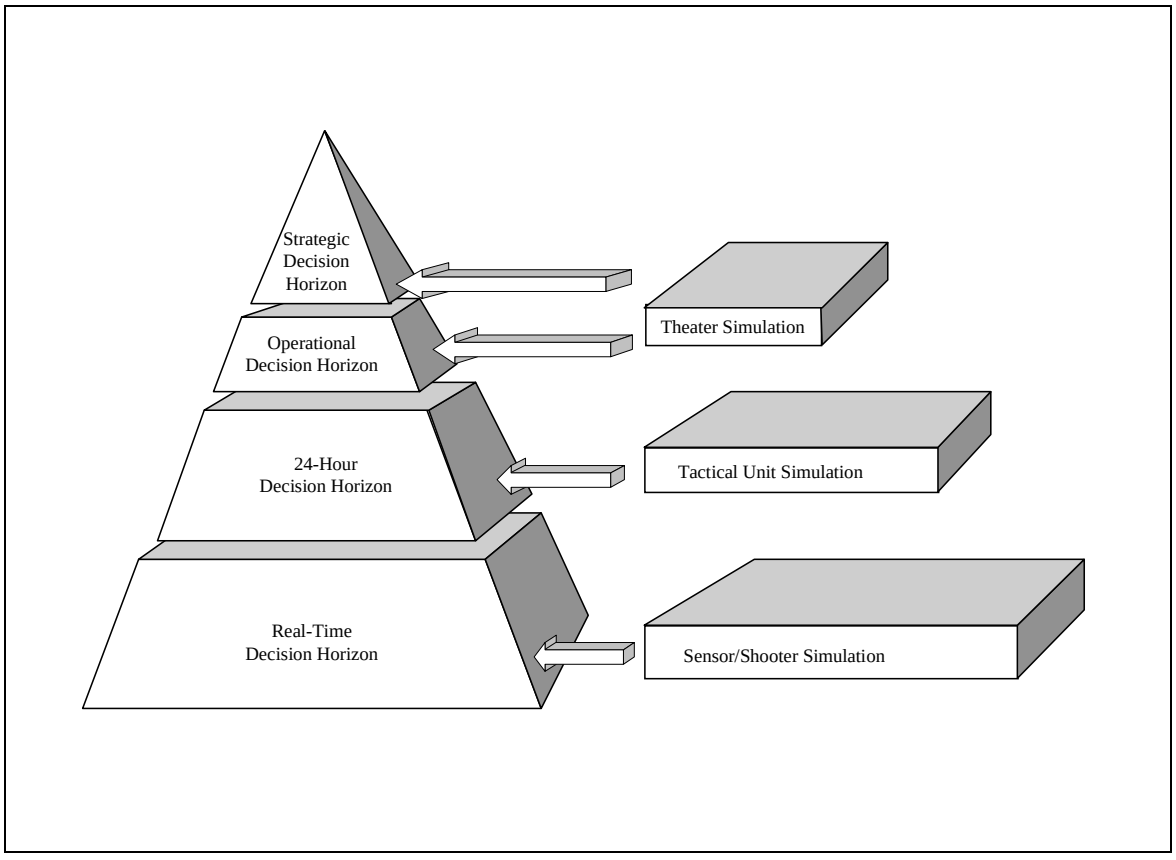

Figure 9. Interaction Between Decision Horizons and Simulations

If an M&S tool is suitable for stressing the operations of a lower-echelon, tactical training audience, then, the semantic gap between the higher-echelon, joint training audience and the tactical simulation is large. Additional layers of software or additional

layers of command and staff personnel must bridge the gap. In either case, the additional layers must process the tactical detail into something that will stress the operations of the primary training audience. Either of those solutions is more costly than providing an M&S tool that directly provides the right level of detail for the joint training audience. *Training an audience working toward strategic and operational decision horizons with a sensor/shooter-level simulation is the most expensive and least effective alternative.*

4.2.3 Meeting the Training Needs of the Unified Commands

A large-scale computer-assisted exercise conducted in the tactical time frame provides a CINC the opportunity to assemble and integrate the command and staff hierarchy and to evaluate the command's ability to execute its mission. Short of a large-scale field or fleet exercise, this opportunity does not exist elsewhere. But this exercise has its limits. The integration of a large force in a single exercise does not provide an opportunity to focus training on any of the myriad of functions and teams that make up the force. Specifically, the real-time nature of this exercise type does not provide an optimal training environment for those elements of the higher-echelon joint commands whose duties are not directly related to current operations.

The training needs of the unified commands are better met by augmenting the large-scale, computer-assisted, tactical time frame exercise capability with a small-scale, computer-assisted, strategic time frame exercise capability. This training event would span several of the command's long-term decision cycles, i.e., from a couple of weeks to several months. The distant decision horizon, and the need for repetition and feedback, requires that the training event be conducted in much faster than real time.

Furthermore, the higher echelon command's need is to explore many alternative decisions, i.e., branches and sequels, rather than to traverse a single path through the decision space. The higher echelon exercise emphasizes available options and is focused on producing a robust strategic plan, rather than on drill-and-practice to produce a smooth functioning tactical or current operations staff. This led one senior unified command staff member to the conclusion that a good operator can adapt an analytic model to a training event, but it is nearly impossible to adapt a training model to analysis. At the unified command level, training is in many ways defined in analytical terms.

The training needs of the unified commands can be most cost effectively supported by a model that provides the appropriate detail to stress operational and

strategic decision making. The model should give equal emphasis to personnel, intelligence, operations, and logistics. A model based on an abstract representation of forces, e.g., units like battalions and squadrons, more cost effectively meets these needs than a highly detailed model, e.g., representing weapon system interactions. Furthermore, strategic decision makers are more likely to be interested in a simulation that represents the *weight and cube*[39] of a tank battalion, its current location and readiness level, its sustainment requirements, and the available sealift and reception capabilities in the theater of operations, rather than in a simulation that calculates line of sight between two opposing tanks and adjudicates a combat outcome based on the kinetic energy impacting the fired-upon tank.

4.3 RECOMMENDATIONS

The immediate problem is not with M&S representation of forces. It is with a training event that is too tactically oriented for the higher echelons. Once training events for the operational and strategic level are adequately defined, then the M&S requirements can be specified. The M&S requirements for a unified command training event are very similar to the M&S requirements for planning and analysis in support of the unified commands.

4.3.1 Recommendations for Higher Echelon Joint Training

The military training strategy has always been to train the pieces and then to integrate them (see Figure 10). Individuals are trained and assembled into small units. Small units are trained in a variety of ways culminating in an externally evaluated FFAX. Larger-unit headquarters are well trained in a CSFX. Commands at the strategic and operational level are most appropriately trained in a wargame. In each type of training event, a tight focus must be maintained on the training audience.

The culminating training event integrates the force and is the most complex and expensive type of training event. The focus is not on the needs of any particular audience. Focus is on command and staff integration, horizontally and vertically. Yet the joint integration exercise has become the event that is expected to produce trained and ready forces. *This study recommends abandoning the expectation that the large-scale,*

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[39] A common phrase referring to the characteristics of a unit and its cargo as it relates to the weight and volume requirements for strategic airlift or sealift.

integrating exercise is an appropriate environment for training all audiences. The following paragraphs make specific recommendations for training at the unified command.

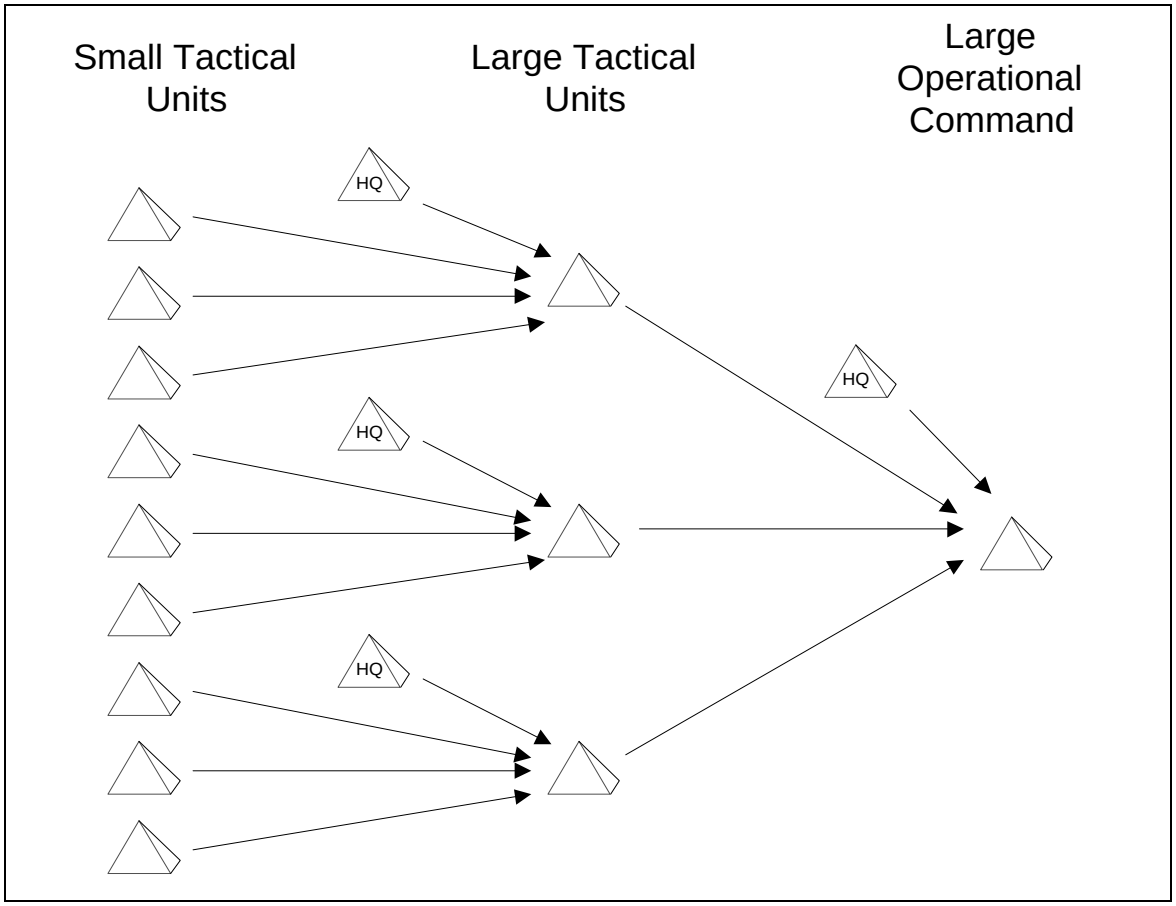

Figure 10. Training as a Succession of Integration Exercises

Exercise to develop strategic theater vision. Conduct an exercise early in a CINC's tenure. The purpose of the exercise would be to build the commander and staff team, i.e., for staff members to understand their new commander and to carry out their specialized daily tasks acting in the CINC's stead. A second purpose of the exercise would be to help the CINC understand the current theater vision and develop his own.

Such an exercise would expose the staff to the full range of the commander's decision-making style, to expose the commander to his staff resources, and to build the commander and staff team. To meet training objectives, the commander and staff should run through the variety of contingencies that might occur in a CINC's AOR. Breadth of

exposure is the objective. Depth can be pursued as needed as significant issues are raised. Pre-execution, execution, and post-execution should all be given equal emphasis.

Exercise to build geographic and functional command teams. A training event that brings together the theater and functional CINCs and their principal staffs apparently does not exist. The functional commands lack the opportunity to provide theater commands with an understanding of their full range of capabilities. Further, the functional commands lack an opportunity to wholly learn the theater commands' warfighting needs. In general, a real-time exercise highlights the capabilities of the Service components and forces the functional commands to participate in tactical operations only. A tactical time frame exercise provides an inadequate training environment for exploring the capabilities of SOCOM, SPACECOM, STRATCOM, and TRANSCOM.

Exercise the planning process. The residual effect of the prior focus on high-intensity conflict that had benefited from years of deliberate planning is an emphasis on that which could not be planned, i.e., an emphasis on plan execution and current operations. However, today's unified commands, and certainly JTFs, have increasing need to produce plans in response to rapidly emerging contingencies. Yet the real-time plan execution exercise has been and remains indisputably the training event of choice.

Strategic decision makers, like their tactical counterparts, require repetition and feedback. Their objective, however, is to produce a robust plan that can stand up to the fog of war that bedevils planners. To produce a robust plan, the appropriate exercise requires consideration of several courses of action, what might defeat a course of action, and the attendant wargaming of those courses of action. They require exploration of many paths throughout the possible decision space, i.e., branches and sequels.

Training in the unified commands should emphasize the planning process under time-sensitive conditions over real-time execution of combat operations. Constructing a Time Phased Force and Deployment List (TPFDL) in six to eight hours, after considering alternative force mixes, is a meaningful objective.

Exercise decision support. Another variant of the wargame is a reflection of the process that frequently takes place within the unified commands. With little or no notice, the planning staff will be tasked to provide alternative actions or options, with pros and cons, for the CINC. As a crisis develops, the CINC may make many requests for analytic support, all part of his continual construction of a vision for crisis response. A wargame

could provide an appropriate training environment for that process. An exercise to train plan development may equally train decision support. Both follow the same process and use the same tools. Training the planning process is the objective.

Exercise the pre-execution phase. Joint Operations Areas are typically not well-developed theaters of operation. Infrastructure is not in place when the JTF arrives. On the contrary, the JTF must plan and deploy communications, intelligence, and logistics infrastructure. Beginning an exercise assuming the necessary infrastructure is in place begs the issue. Infrastructure deployment has been shown to be problematic and warrants training. Many of the joint commands' functions must be accomplished before tactical employment begins. Simulations focused on tactical combat adjudication will not support this critical type of training.

Exercise crisis termination with joint and interagency audiences. The unified commands no longer focus on a single, theater-wide conflict. Instead, they are faced with several disparate contingencies, each prosecuted by a distinct JTF with its own Joint Operations Area. The JTF is responsible for conducting the operational level of war—planning and conducting tactical operations to meet strategic objectives—but the unified command remains responsible for accomplishment of strategic objectives. Crisis termination is the responsibility of the CINC, the CJCS, the State Department, the National Security Council, and the NCA. It is best explored as a wargame. The JTF's operational objectives may be concerned with the defeat or containment of a military opponent, while the strategic objectives could be about balance of power and stability in the region after crisis termination. The M&S support for such an exercise is not about tactical engagements but about aggregate balance of military power, political forces, and macro economics. Sensor/shooter simulations miss the mark in this case.

Exercise real-time audiences in real time. Some audiences require real-time training with weapon system and sensor system level of detail. Some intelligence audiences fall into this category, even if they are responsible for strategic collection assets and strategic weapons. Some audiences require a continuous air picture. Train them accordingly and with the appropriate M&S tools.

Focus on the needs of the commander and principal staff. Important needs of the CINC and his staff are more cost effectively supported by an exercise that provides the appropriate detail to stress operational and strategic decision making. The exercise should give equal emphasis to personnel, intelligence, operations, logistics, and communications. A stressful training event for the unified commands would span crisis

response, mobilization, deployment, employment, sustainment, crisis termination, and redeployment, as depicted previously in Figure 8.

Include forces in unified command exercises as the exception. The trend from assignment to apportionment and high OPTEMPO of today's smaller force pool make it increasingly difficult to anticipate which units will be allocated for a specific operation. Training at unified commands should focus on the unified command, JTF, and component command headquarters—commanders and staffs. Those are the known elements. Focusing on training with apportioned forces should only be done when there is an almost certain probability that apportioned forces will be allocated. For example, early arriving forces are typically apportioned to a single unified command. Including other lower-echelon headquarters that may be apportioned to two or more unified commands dilutes training focus, can increase PERSTEMPO, and should be done as the exceptional case.

Exercises for lower-echelon forces should be conducted separately and in a joint environment (Category I) and should focus on tactical operations. Component interoperability exercises (Category II) should be conducted for higher-echelon Service headquarters, also in a joint environment. The emphasis should be on producing Service forces that can integrate into any JTF.

Simplify and standardize procedural interfaces between components and units. Procedures between the known elements (unified command, JTF, and component command headquarters) and the unknown elements (potentially allocated forces) should be simple and standardized. The unified command will have to fight with whatever forces are allocated. Component forces will have to fight for whichever unified command they are allocated. Simple and standardized interfaces facilitate this flexibility.

Consider non-technological solutions. Some shortcomings of an exercise are better met by technological fixes, while others may be better met by non-technological approaches. Use cost-effectiveness criteria to decide which approach is implemented.

The audience must be engaged in the process to be trained. Highly realistic scenarios and exercise environments (using their real command post and tools) have been shown to actively engage the audience. A seminar wargame may not. The presence and attitude of the commander of the echelon being trained and the commander of the echelon above contribute greatly to audience engagement and the concomitant training effectiveness. The higher the echelon being trained, the more difficult it is to have the

constant presence and active involvement of the higher-echelon commander. But the commander's time is highly leveraged.

Feedback is provided by trained observers and by operators of the M&S tools used for training. Training audiences of the past have uniformly agreed on the importance of having informed outside observers present during the training event. As the echelon of the training audience moves up, the more difficult it is to find truly qualified observers. The fraction of military personnel with joint operational and strategic background is actually quite small when compared to the large majority with tactical backgrounds. A cadre of observers made up of highly qualified Joint Specialty Officers is an essential contributor to training feedback through the after action review process.

Members of training audiences commonly complain about the realism of the computer simulation when it adjudicates the consequences of their actions differently than expected. Also common is the complaint that the audience is too frequently aware of the computer simulation's presence. The response cell is the buffer between the training audience and the M&S tools. The senior member of the response cell staff can provide exercise realism beyond the simulation. In one exercise, a lightning strike disconnected the response cell from the simulation for over an hour. The exercise continued without the audience knowing of the communications failure due entirely to the high quality of the response cell staff. No software could have done better.

Meeting training objectives is not left to chance. Significant events are typically preplanned and recorded in a Master Schedule of Events List (MSEL). These events take place independent of the M&S tool's ability to generate them. In addition, a senior controller, often a retired general or flag officer with unquestioned credibility, will dynamically inject events into the exercise to keep the training audience on the horns of a dilemma. Preparation of the MSEL and the dynamic interaction of the senior controller contribute greatly to meeting training objectives.

4.3.2 Recommendations for Joint Simulations

To a large extent, the recommendations that follow are derived directly from the preceding recommendations for joint training.

Gather requirements by cases. One approach is to view next generation M&S tools as a family of simulations, or as an erector set from which many simulations can be

composed. The most difficult and least success-prone path is to build a monolithic simulation. The requirements for a next generation joint M&S tool should be organized by cases. Cases should be developed for the breadth of training events, including those for unified commands, JTFs, non-defense agencies, and tactical echelons. Simulations must support pre- and post-execution phases, not just the execution phase. Simulations must support training audiences who work in real time, within the 24-hour staff cycle, and toward the operational and strategic decision horizon. It is hard to imagine that a single M&S tool will meet the requirements of the diverse audiences identified in this paper.

Ensure adequate emphasis on planning and analysis. The M&S community is split along functional lines between analysis and training. This distinction is meaningful at the tactical engagement level, but it fails at the strategic and operational level. Both the analytic and training needs of the strategic users might be met with a single model. Tactical users, including acquisition analysts and Service trainers, require far more detail, often including weapons-level or even physics-based detail.

Ensure adequate emphasis on deployment, employment, sustainment, and redeployment. The trend from deployed to deployable forces argues for an even greater emphasis on strategic and theater mobility. The trend from theater-wide warfare toward multiple, simultaneous JOAs reinforces the argument. An established theater such as Central Europe is more likely to have in-place infrastructure—people and facilities—for reception, staging, onward-movement, and integration. Moreover, the unified command is intimately familiar with that infrastructure. On the other hand, the typical JOA emerges in undeveloped areas without adequate infrastructure or with unfamiliar infrastructure. This is particularly true of those JOAs established in developing countries for humanitarian assistance, disaster relief, and peace operations. Joint M&S tools should support exercises of strategic deployment of infrastructure.

Ensure adequate emphasis on military operations other than war. The political-military wargame is an increasingly prevalent form of training event. Retrofitting non-combat operations into combat models has been problematic in the past; developers of future models should not assume it would be any easier today. Joint M&S tools for MOOTW must orient toward contagion and natural disasters, macro-economic and soft sociological variables; include local and regional infrastructure (e.g., water treatment, hospitals) and NGOs; and run much faster than real time. Logistics and movement are a constant to war and MOOTW models.

Ensure adequate emphasis on information operations. There are different audiences that practice information operations. At the tactical level, such operations may appear quite similar to conventional electronic warfare operations. At the higher echelon and joint level, they may take on new meaning. Still another community, perhaps at a national level, may also be practitioners in the future. They may require separate training events, different M&S tools, and a culminating integration or coordination exercise.

At the tactical level, simulations to support information operations may require detailed representation of command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) assets. A robust representation of information flows down to the message level and a thorough representation of enemy command and control processes may all be required. At a strategic level, a nation's public and political will or its economy might be the target of attack. Simulations to support higher-order information operations should represent social, political, and economic variables and interactions, not C4ISR assets.

Provide appropriate representations of theaters and JOAs. Views of the theater of operations and multiple JOAs should be provided, each with the appropriate level of detail. The theater view is not the sum of all JOA views. A model representing the theater view linked to individual models representing the JOA views must necessarily be a less expensive solution than a single model that represents the entire theater in a level of detail appropriate for a JOA. The latter implies meeting some fascinating technical challenges but provides no discernible training advantages to the former.

Build tools for small staffs and quick response. The unified commands have very few people to support a training event. Therefore, only a very few operators should be required to prepare a data base for a training event, and very few operators to support the actual event. Exercise support, probably including a simulation model, should satisfy those requirements to be judged cost effective. They must run much faster than real time. The ability to produce a distribution of outcomes at an abstract level of detail is more important than producing a single, plausible outcome in great detail.

However, the perception from the unified commands is that current investments in modeling and simulation are oriented toward more complex, detailed, and expensive exercises. A model based on an abstract representation of forces, e.g., units like battalion task forces and multi-ship air mission packages, more cost effectively meets these needs than a highly detailed model, e.g., one representing individual weapon systems.

If a model is built to meet the training needs of the unified commands, it is equally applicable to their analytic needs. Or more correctly, a model suitable for strategic and operational planning and analysis can be used to meet the training needs of the unified commands. Those requirements include the ability to quickly generate and evaluate alternative courses of action; to wargame several scenarios; to do capability trade off studies, e.g., sending heavy or light forces, sending air or ground forces; and to explore the time phasing of alternative force deployments. Again, a great amount of detail is not a requirement. Quick preparation, low operator costs, and turnaround measured in hours are requirements.

4.3.3 Recommendations for Further Study

Quantify the cost effectiveness of two or more major exercises. This study describes a set of cost and effectiveness measures and qualitatively assesses five broad categories of exercises using those measures. Further, the study argues that the more expensive exercises have multiple echelons in the training audience, serve well as a culminating integration exercise, but have insufficient focus to train many elements of the audience well. This is the fundamental tradeoff made in the large-scale exercise: *focus* versus *integration*.

We recommend a case study approach designed to advance the level of understanding of exercise costs and effectiveness tradeoffs. Two established exercise series, ACOM's Unified Endeavor and PACOM's Tempo Brave, both focus on JTFs but are structured quite differently than ACOM's exercises. Adding an examination of the Ulchi-Focus Lens exercise held in Korea would produce a more robust study. The purpose of the study should be to ascertain how effective these different training structures are at training the different elements of their training audiences.

Shift analytic attention from the single exercise to the entire training calendar. A single exercise cannot and need not satisfy the needs of all training audiences. We conclude that the large-scale, tactical time frame, computer-assisted exercise is tacitly expected to serve as the ultimate training event for each element of the command and staff hierarchy. We recommend abandoning this expectation and adopting a more systematic examination of the training calendar, i.e., the series of exercises that train the pieces and successively assemble them into a joint force. For example, it is customary in the respective Services to build to a high state of operational readiness through a series of increasingly challenging and inclusive set of training events. The

culminating training event is not expected to be the only training event. Such is not yet the case for joint training. Piggybacking joint exercises on top of Service exercises is common. The effectiveness of the training calendar, the succession of training events, is the issue at hand. *The cost effectiveness of any individual training event must be considered in the context of the whole.*

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ACRONYMS AND ABBREVIATIONS

AAR	after action review
ACOM	United States Atlantic Command
AOR	Area of Responsibility
ARFOR	Army forces
AFFOR	Air Force forces
C4I	command, control, communications, computers, and intelligence
C4ISR	C4I surveillance and reconnaissance
CENTCOM	US Central Command
CINC	Commander in Chief
CINCCENT	Commander in Chief Central Command
CINCUNC	Commander in Chief United Nations Command (Korea)
CONPLAN	operation plan in concept format, or concept plan
EUCOM	United States European Command
GCCS	Global Command and Control System
J-1	Joint Staff, Manpower and Personnel Directorate
J-2	Joint Staff, Intelligence Directorate
J-3	Joint Staff, Operations Directorate
J-4	Joint Staff, Logistics Directorate
J-5	Joint Staff, Strategic Plans and Policy Directorate
J-6	Joint Staff, Command, Control, Communications, and Computer Systems Directorate
J-7	Joint Staff, Operational Plans and Interoperability Directorate
J-8	Force Structure, Resources, and Assessment Directorate
JFC	Joint Force Commander
JOA	Joint Operations Area
JTF	Joint Task Force
JSCP	Joint Strategic Capabilities Plan

JSIMS	Joint Simulation System
JTASC	Joint Training, Analysis and Simulation Center
JWARS	Joint Warfare System
MARFOR	Marine Corps forces
MSEL	master schedule of events list
M&S	modeling and simulation
NAVFOR	Navy forces
NCA	National Command Authorities
OPLAN	Operational Plan
PACOM	United States Pacific Command
SACEUR	Supreme Allied Commander Europe
SACLANT	Supreme Allied Commander Atlantic
SOCOM	United States Special Operations Command
SOF	Special Operations Forces
SOP	standard operating procedure
SOUTHCOM	United States Southern Command
SPACECOM	United States Space Command
STRATCOM	United States Strategic Command
TPFDD	Time-Phased Force and Deployment Data
TPFDL	Time-Phased Force and Deployment List
TRANSCOM	United States Transportation Command
UCP	Unified Command Plan
UNAAF	Unified Action Armed Forces, Joint Pub 0-2
US	United States
USA	United States Army
USAF	United States Air Force
USMC	United States Marine Corps
USN	United States Navy